SOIL SURVEY OF

Shelby County, Indiana

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Purdue University Agricultural Experiment Station

Issued March 1974

Major fieldwork for this soil survey was done in the period 1960–67. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1968. This survey was made cooperatively by the Soil Conservation Service and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Shelby County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Shelby County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the capability unit in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the interpretive groups.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for recreation areas in the section "Use of the Soils for Recreation."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers in Shelby County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the County."

Cover picture: **Landscape in Shelby County showing a soil pattern of dark-colored, very poorly drained Brookston soils and lighter colored, somewhat poorly drained Crosby soils.**

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SOIL SURVEY OF SHELBY COUNTY, INDIANA

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

SHELBY COUNTY is in the southeastern part of central Indiana (fig. 1) and has an area of 409 square miles, or 261,760 acres. The county is rectangular and extends 24 miles from north to south and 17 miles from east to west. Shelbyville, the county seat and largest city, is located near the center of the county.

Farming is the leading occupation, with cash-grain and livestock the major types of farming. The major livestock program is hog and beef cattle feeding, but there are also several dairy farms.

Some of the land is being developed for nonfarm uses around Shelbyville and along Interstate 74 in the northwestern part of the county. The use of soils for farming is emphasized in this survey, but attention is also given to nonfarm uses.

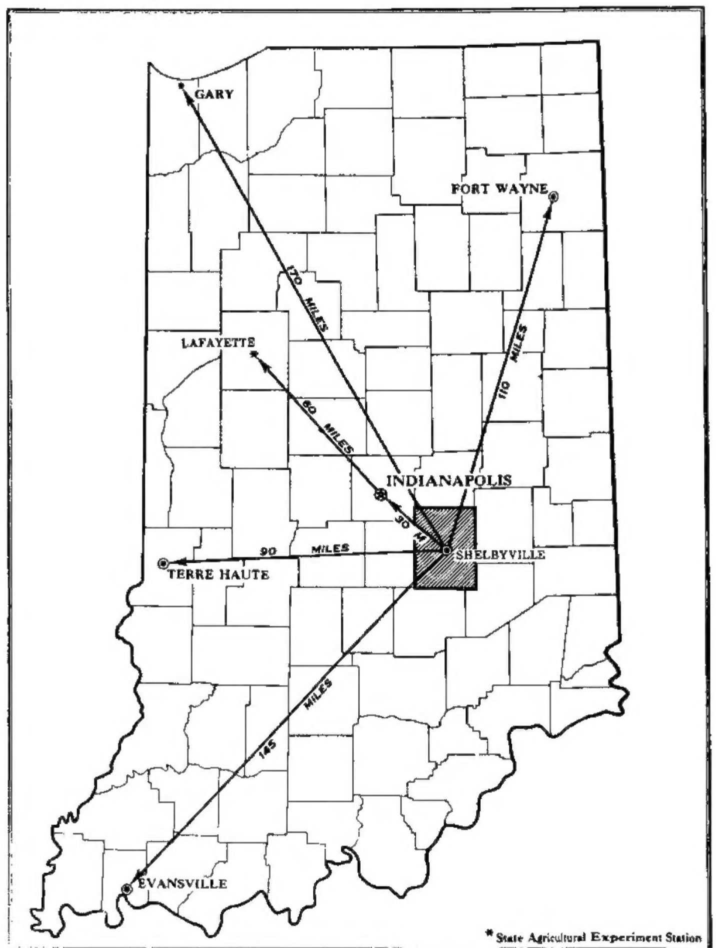

Figure 1.—**Location of Shelby County in Indiana.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Shelby County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and nature of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey (*6*).[1]

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Brookston and Crosby, for example, are the names of two soil series. All the soils in the United States having the same series name

[1] Italicized numbers in parentheses refer to Literature Cited, page 91.

are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Miami silt loam, 2 to 6 percent slopes, eroded, is one of several phases within the Miami series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units shown on the soil map of Shelby County are soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Crosby-Miami silt loams, 0 to 6 percent slopes, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Westland and Brookston loams, overwash, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Gravel pits and Quarries are land types in Shelby County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of recreational areas, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Shelby County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Shelby County are discussed in the following pages.

1. Crosby-Brookston association

Deep, somewhat poorly drained and very poorly drained, nearly level and gently sloping, medium-textured and moderately fine textured soils; on uplands

Soils in this association are in the uplands. The dark-colored Brookston soils are generally in slight depressions, and the somewhat lighter colored Crosby soils are at slightly higher elevations (fig. 2). This association makes up about 249 square miles, or 61 percent of the county. Crosby soils make up about 45 percent of the association; Brookston soils, about 30 percent; and minor soils, the remaining 25 percent. The farms generally exceed 160 acres in size, and some are more than 500 acres.

The nearly level and gently sloping Crosby soils are on low knolls and ridges. They are somewhat poorly drained and have a dark grayish-brown, medium-textured surface layer. The grayish-brown subsoil is moderately fine textured and is mottled. The underlying calcareous, medium-textured till is at a depth of 24 to 40 inches.

The Brookston soils occupy depressions. They are deep and are very poorly drained. They have a very dark gray, moderately fine textured surface layer and a mottled, moderately fine textured subsoil. Calcareous, medium-textured till is at a depth of 38 to 50 inches.

Figure 2.—**Landscape in the Crosby-Brookston association.**

Among the minor soils of this association are the well-drained Miami soils on knolls and breaks, the well-drained Hennepin soils on short steep breaks near intersecting streams, and the somewhat poorly drained Shoals soils in narrow bottom lands.

If adequately drained and properly managed, these soils can be used intensively for crops. Corn and soybeans are the main crops, and minor acreages are used for small grains and meadow. Cash-grain farming, hogs, and feeder cattle are the major sources of farm income.

This association has severe limitations for urban development or for use as septic tank filter fields. The main limitation of the Brookston and Crosby soils is wetness.

2. *Fox-Nineveh-Ockley association*

Well-drained, nearly level to gently sloping, medium-textured soils that are moderately deep and deep over gravel and sand; on terraces

This association consists of the nearly level to gently undulating soils on terraces along the major streams. This association totals approximately 53 square miles, or 13 percent of the county. Fox soils make up about 38 percent of this association; Nineveh soils, about 32 percent; Ockley soils, 10 percent; and small areas of other soils, the remaining 20 percent.

Fox soils are moderately deep, well drained, and nearly level and gently sloping. They have a brown, medium-textured surface layer and a dark-brown or dark reddish-brown, moderately fine textured subsoil. The underlying loose, limy, stratified gravel and sand is at a depth of 24 to 42 inches.

Nineveh soils are moderately deep, well drained, and nearly level and gently sloping. They have a dark-brown, medium-textured surface layer and a subsoil of dark-brown and dark reddish-brown, moderately fine textured, neutral gravelly clay loam. They are underlain by loose, stratified, limy gravel and sand at a depth of 24 to 42 inches.

Ockley soils are deep, well drained, and nearly level. They have a brown, medium-textured surface layer and a reddish-brown, dark-brown, and dark reddish-brown, moderately fine textured subsoil. They are underlain by loose, stratified, limy gravel and sand at a depth of 42 to 60 inches.

Among the minor soils of this association are the nearly level, somewhat poorly drained Sleeth soils; the nearly level, very poorly drained Westland soils; and steep and very steep, well-drained Rodman soils.

This association is used mainly for crops, but some areas near Shelbyville are used for urban development and smaller areas are used as a source of gravel. The major limitation is droughtiness on the moderately deep soils. Cash-grain farming is the main enterprise, and corn and wheat are the major crops grown. Irrigation is used on some farms.

The soils of this association have slight limitations for urban development and for use as septic tank filter fields.

Shallow wells are subject to pollution from nearby septic tanks.

3. *Fox-Rodman association*

Well-drained, moderately steep and steep, medium-textured and moderately coarse textured soils that are moderately deep to shallow over gravel and sand; on kames

This association consists of moderately steep and steep soils on high hills that are gravel kames left by the Wisconsin Glacier (fig. 3). This association occupies about 2 square miles, or about 1 percent of the county. Fox soils make up about 50 percent of the association; Rodman soils, about 30 percent; and small areas of major soils, the remaining 20 percent.

Fox soils are well drained, moderately deep, and moderately steep. They have a dark-brown, medium-textured surface layer and a dark-brown and dark reddish-brown, moderately fine textured subsoil. They are underlain by loose, stratified limy gravel and sand at a depth of 24 to 42 inches.

Rodman soils are shallow, well drained, and steep. They have a dark-brown, moderately coarse textured surface layer and a thin, dark-brown, moderately coarse textured subsoil that is underlain by loose gravel and sand at a depth of less than 15 inches.

Minor soils are the nearly level, very poorly drained Westland and Brookston soils; the nearly level or gently sloping, somewhat poorly drained Crosby and Whitaker soils; and the sloping, well-drained Miami soils. The Miami soils formed in till.

This association is mainly used for pasture, but areas around the base of the hills are used for crops. The level and gently sloping soils between the hills are used mainly for row crops.

Some of the hills have old gravel pits. The gravel in these areas has fine material mixed with it.

The slope of the major soils of this association severely limits their use for urban development and for septic tank filter fields.

4. *Genesee-Ross-Shoals association*

Deep, well-drained and somewhat poorly drained, nearly level, medium-textured soils; on flood plains

The soils in this association are nearly level and occupy bottom lands along the larger streams. This association occupies about 33 square miles, or 8 percent of the county. Genesee soils make up about 30 percent of the association; Ross soils, about 25 percent; Shoals soils, about 20 percent; and small areas of minor soils, the remaining 25 percent.

Genesee soils are deep, nearly level, and well drained. They occupy the bottom lands adjacent to nearly all of the major streams. They have a dark-brown, medium-

Figure 3.—Gravel kame in the Fox-Rodman association. Rodman soils are on the steep areas and Fox soils are on the moderately steep areas. Whitaker and Brookston soils are in the foreground.

textured surface layer and a brown, medium-textured subsoil that is underlain by loamy alluvium.

Ross soils are deep, nearly level, and well drained. They have a very dark brown, medium-textured surface layer and a very dark brown, medium-textured subsoil underlain by loamy alluvium (fig. 4).

Shoals soils are deep, somewhat poorly drained, and nearly level. They have a dark grayish-brown, medium-textured surface layer and a dark grayish-brown, medium-textured, mottled subsoil. They are underlain by loamy alluvium.

Among the minor soils in this association are the deep, moderately well drained Medway and Eel soils and the very poorly drained Saranac soils.

This association is used mainly for crops. Some narrow areas adjacent to the streams, some low, wet meander channels, and areas that are small and irregular are in trees or grass. Corn and soybeans are the main crops grown. Unless the area is protected from flooding or flooding is only occasional, small grains are subject to water damage.

Cash-grain farming is the main type of farming. Nearly every bottom-land farm extends onto the adjacent terraces or uplands. The buildings are all located on the higher areas.

This association has severe limitations for urban development and for use as septic tank filter fields because of flooding.

5. *Miami-Crosby association*

Deep, well-drained and somewhat poorly drained, nearly level to rolling, medium-textured soils; on uplands

This association consists of gently undulating and rolling soils on uplands. The terrain is very irregular (fig. 5), and each individual soil occupies only a very small area at any one place. This association occupies about 13 square miles, or 3 percent of the county. The Miami soils make up 50 percent of the association; Crosby soils, about 30 percent; and small areas of minor soils, the remaining 20 percent.

Miami soils are deep, well drained, and gently undulating and rolling. They have a dark-brown, medium-textured surface layer and a dark yellowish-brown, moderately fine textured subsoil. The subsoil is underlain by calcareous, medium-textured till at a depth of 24 to 42 inches.

Crosby soils are deep, somewhat poorly drained, and nearly level and gently undulating. They have a dark grayish-brown, medium-textured surface layer and a grayish-brown and brown, moderately fine textured, mottled subsoil. The subsoil is underlain by calcareous, medium-textured till at a depth of 24 to 40 inches.

Among the minor soils in this association are the somewhat poorly drained Shoals soils and the very poorly drained Brookston soils in the low pockets and swales between the rolling ridges.

The use of this association is limited by an erosion hazard and wetness. Because low pockets are between many interconnecting ridges, it is difficult to obtain drainage outlets. The slopes on the knolls and ridges are short. Water often ponds in the low pockets for several days following a rain. When the better drained soils are dry enough to cultivate, the lower, somewhat poorly drained soils are usually too wet.

This association is mainly used for cash-grain farming, and corn and soybeans are the main crops. Winter grain is often damaged by ponding of water in low areas. Some small areas, too wet for crops, are used for pasture.

The Crosby soils of this association have severe limitations for urban development and septic tank filter fields, and the Miami soils have moderate limitations.

Figure 4.—Corn on dark-colored Ross and Medway soils in the Genesee-Ross-Shoals association.

Figure 5.—Irregular terrain in the Miami-Crosby association. Water is ponded in the foreground.

6. *Miami-Crosby-Hennepin association*

Deep, well-drained and somewhat poorly drained, nearly level to steep, medium-textured soils; on uplands

The nearly level to steep soils in this association are on upland areas that are somewhat dissected by streams. The association occupies about 22 square miles, or 5 percent of the county. Miami soils make up about 30 percent of the association; Crosby soils, about 30 percent; Hennepin soils, about 20 percent; and small areas of minor soils, the remaining 20 percent.

The deep, well-drained Miami soils are gently sloping on the ridges to moderately steep in the breaks. These soils have a dark-brown, medium-textured surface layer and a dark yellowish-brown, moderately fine textured subsoil. They are underlain by calcareous, medium-textured till at a depth of 24 to 42 inches.

The deep, somewhat poorly drained Crosby soils are nearly level and gently sloping and are on the ridgetops. These soils have a dark grayish-brown, medium-textured surface layer and a grayish-brown and brown, moderately fine textured, mottled subsoil. They are underlain by calcareous, medium-textured till at a depth of 24 to 42 inches.

The deep, well-drained Hennepin soils are steep and occur in the breaks along the drainageways. These soils have a dark-brown, medium-textured surface layer and a thin, dark-brown, medium-textured subsoil. They are underlain by calcareous, medium-textured till at a depth of 10 to 20 inches.

Among the minor soils in this association are the somewhat poorly drained Shoals soils and the moderately well drained Eel soils in the narrow stream bottoms. The steep, shallow Corydon soils and the nearly level to gently sloping, moderately deep Milton and Randolph soils formed near St. Paul, where the limestone is near the surface.

The nearly level to moderately steep soils have been cleared for the most part and are used for crops and pasture. The steeper soils are still wooded. The major hazard on the steep soils is erosion. On the nearly level soils, wetness is a limitation.

Most of the farms in this area are of the general type. Farms that average about 200 acres in size have some beef cow herds and dairy herds.

Limitations for urban development and use of this association for septic tank filter fields are severe on the Crosby soils, moderate on the gently sloping and sloping Miami soils, and severe on the moderately steep and steep Hennepin soils. However, suitable building sites can be developed on less sloping areas and ridges that are intermixed with the Hennepin soils (fig. 6).

7. *Parke-Miami-Negley association*

Deep, well-drained, gently sloping to steep, medium-textured soils; on uplands and terraces

This association consists of gently sloping to steep soils (fig. 7) on the high ridges of glacial till and outwash. This association occupies about 5 square miles, or 1 percent of the county. Parke soils make up about 30 percent of the association; Miami soils, 27 percent; Negley soils, about 13 percent; and small areas of other soils, the remaining 30 percent.

The deep, well-drained Parke soils are on ridges and hillsides. They have a brown, medium-textured surface layer. The upper part of the subsoil is medium textured and is dark yellowish-brown. It is underlain by about 10 inches of dark-brown silty clay loam. Below this, at a depth between 24 and 144 inches, is yellowish-red sandy clay loam that grades to sandy loam in the lower part. The underlying material, at a depth below 144 inches, is loose, calcareous gravel and sand.

The deep, well-drained Miami soils are gently sloping to moderately steep and are on hillsides. They have a dark-brown, medium-textured surface layer and a dark yellowish-brown, moderately fine textured subsoil. They are underlain by calcareous, medium-textured Wisconsin age till at a depth of 24 to 42 inches. In this area there is 1 to 20 feet of till over older gravel and sand.

The deep, well-drained Negley soils are steep and are on hillsides. They have a dark yellowish-brown and yellowish-brown, medium-textured surface layer and a dark-brown, reddish-brown, and dark reddish-brown, moderately fine textured subsoil. They are underlain by stratified, moderately fine textured to moderately coarse textured material of Illinoian age at a depth of about 50 inches. Loose, calcareous sand and gravel are at a depth of 10 to 15 feet.

This area was partly bypassed by the Wisconsin Glacier. In places the glacier rode up over some of the ridges and scraped along the sides of the hills, removing the soil. In other places it deposited a thin layer of reworked material.

Among the minor soils in this association are the well-drained, moderately deep Fox soils; the well-drained Princeton soils that developed in windblown sand; small areas of steep Hennepin soils; and narrow areas of bottom-land soils.

Although some of this association along Indiana Highway 252 is used for houses, nearly 70 percent of the acreage has been cleared and is now used for crops, orchards, and pasture. Most of the Negley soils are wooded or are in pasture.

The major hazard in the use and management of these soils is erosion. The main crops are corn, soybeans, small grains, and hay. These soils cannot be farmed as intensively as the more level areas of the county. About 30 percent of the cleared land is in permanent pasture or hay. Most of the Negley soils are used for trees or permanent pasture.

Farms are mostly of the general type. Most of the farms extend onto other associations. Some of the farmers use these soils for pasture and hay and use the more nearly level soils in the adjoining associations for row crops.

There are several small gravel pits in this association, but the gravel usually contains fine material and chunks of lime-cemented gravel. Except in small pockets, the gravel is of little commercial value.

Moderately steep soils of this association have severe limitations for urban development and for septic tank filter fields. Sloping soils and the gently sloping Miami soils have moderate limitations. The gently sloping Parke soils have slight limitations.

Figure 6.—Homes on Miami and Hennepin soils that are marginal farmland because of slope.

8. *Westland-Sleeth association*

Deep, very poorly drained and somewhat poorly drained, nearly level, moderately fine textured and medium-textured soils; on glacial outwash plains and on terraces

The soils in this association occupy the gravelly terraces. The association occupies 32 square miles, or 8 percent of the county. Westland soils make up about 60 percent; Sleeth soils, about 20 percent; and small acreages of minor soils, the remaining 20 percent. In the general pattern of soils in this association, the dark-colored Westland soils are in slight depressions and the lighter colored Sleeth soils are on slightly higher positions.

The deep, nearly level, very poorly drained Westland soils occupy both narrow and wide depressions on the old glacial drainageways. In some places the depressions are about a mile wide. Westland soils have a very dark gray, moderately fine textured surface layer underlain by about 6 inches of black clay loam. The subsoil is dark gray and gray, is moderately fine textured, and is mottled with yellowish brown. The subsoil is underlain by loose, calcareous gravel and sand at a depth of 42 to 60 inches.

The deep, nearly level, somewhat poorly drained Sleeth soils occupy the slightly higher flats and ridges on terraces and in the glacial outwash plain. They have a dark grayish-brown and grayish-brown, medium-textured surface layer. They have a brown, grayish-brown, and dark-gray, moderately fine textured, mottled subsoil. The subsoil is underlain by calcareous, loose sand and gravel at a depth of 40 to 60 inches.

Among the minor soils in this association are the well-drained Fox and Ockley soils; the very poorly drained, moderately deep Sebewa soils; the very poorly drained, deep Rensselaer soils; and the somewhat poorly drained Whitaker soils.

Although some small areas are still wooded, most of the association is used for crops. Some areas are used for houses, and a part of Shelbyville is located on these soils.

The major limitation to use of the Westland and Sleeth soils is wetness. Some of the Westland soils have a hazard of flooding. If adequately drained and properly managed, these soils are suited to intensive crop production. Corn and soybeans are the main crops grown.

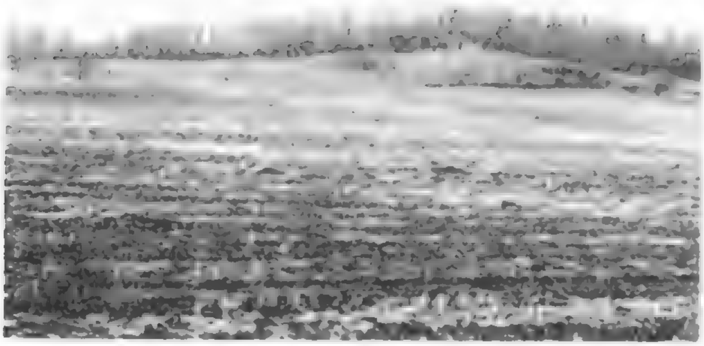

Figure 7.—Hill in Parke-Miami-Negley association contains Illinoian age gravelly material.

This association is mainly used for cash-grain farming, hogs, and feeder cattle. The farms are 300 acres or larger.

Wetness severely limits the use of this association for urban development and septic tank filter fields.

Descriptions of the Soils

In this section the soil series and mapping units represented in this county are described. The approximate acreage and proportionate extent of each mapping unit are given in table 1.

The soils of each series are first described as a group. Important features common to all the soils of the series are listed, and the position of the soils on the landscape is given. Each series description has a short narrative description of a representative profile and a much more detailed description of the same profile, from which highly technical interpretations can be made. Following the profile is a brief statement of the range of characteristics of the soils in the series, as mapped in this county. Comparisons are made with other soils that either are located nearby or are generally similar to the soils of the series being described.

Each soil, or mapping unit, in the series is next described. These are the areas delineated on the map and identified by soil symbols. Generally, these descriptions tell how the profile of the soil differs from that described as representative of the series. They also tell about the use and suitability of the soil described and something about management needs.

For full information about any one mapping unit, it is necessary to read the description of the soil series as well as the description of the mapping unit. General information about the broad patterns of soils in the county is given in the section "General Soil Map." Unless otherwise indicated, the color names and color symbols given are for moist soil.

Ayrshire Series

The Ayrshire series consists of deep, somewhat poorly drained, nearly level or depressional soils. These soils formed in wind-deposited fine sand and silt on uplands. The native vegetation was hardwood forest.

In a representative profile, the surface layer is dark grayish-brown fine sandy loam about 8 inches thick. The subsurface layer is about 8 inches of pale-brown fine sandy loam that contains yellowish-brown and light brownish-gray mottles. The subsoil is about 28 inches thick. It is friable, light brownish-gray loam that has light yellowish-brown and pale-brown mottles in the upper 7 inches. The middle 7 inches is firm, grayish-brown sandy clay loam that has yellowish-brown and brown mottles. The lower part is about 14 inches of firm, brown sandy clay loam that has grayish-brown and yellowish-brown mottles. The underlying material, at a depth of about 44 inches, is pale-brown, stratified fine sand and silt.

The available moisture capacity is high, and permeability is moderate. Organic-matter content is low. The surface layer is medium acid unless it has been limed. Wetness is the main limitation to farming. Most areas of these soils are cultivated. If adequately drained, these soils are suited to most crops generally grown in the county.

Representative profile of Ayrshire fine sandy loam, in a cultivated field 340 feet east and 900 feet north of the southwest corner of the NW¼ sec. 32, T. 11 N., R. 6 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

A2—8 to 16 inches, pale-brown (10YR 6/3) fine sandy loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2); weak, medium, platy structure; friable when moist; few wormholes and worm casts; slightly acid; clear, smooth boundary.

B1—16 to 23 inches, light brownish-gray (10YR 6/2) loam; many, fine, distinct mottles of light yellowish brown (10YR 6/4) and pale brown (10YR 6/3); weak, fine, subangular blocky structure; friable when moist; few, thin, discontinuous clay films on ped faces; slightly acid; clear, smooth boundary.

B21t—23 to 30 inches, grayish-brown (10YR 5/2) sandy clay loam; many, medium, distinct, yellowish-brown (10YR 5/4 and 5/6) and brown (10YR 5/3) mottles; moderate, medium, subangular blocky structure; firm when moist; grayish-brown (10YR 5/2), medium, continuous clay films on peds; strongly acid; clear, smooth boundary.

B22t—30 to 44 inches, brown (10YR 5/3) sandy clay loam; many, medium, distinct, yellowish-brown (10YR 5/4) and grayish-brown (10YR 5/2) mottles; weak, coarse, subangular blocky structure; firm when moist; grayish-brown (10YR 5/2), medium, continuous clay films on peds; medium acid; clear, wavy boundary.

C—44 to 60 inches, pale-brown (10YR 6/3), stratified fine sand and silt; massive; friable when moist; calcareous; moderately alkaline.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2). The A2 horizon ranges from grayish brown (10YR 5/2) to pale brown (10YR 6/3). The B1 horizon is very thin or lacking in some areas. The B2 horizon ranges from grayish brown (10YR 5/2) to brown (10YR 5/3) in color and from sandy clay loam to clay loam in texture. A thin, gray (10YR 5/1) or grayish-brown (10YR 5/2) B3 horizon occurs in some areas. The solum is generally 40 to 48 inches thick.

The Ayrshire, Whitaker, and Crosby soils are on similar landscapes. The Ayrshire soils have a higher content of sand in the solum than the Whitaker soils. They have a thicker and sandier solum than the Crosby soils. The somewhat poorly drained Ayrshire soils are closely associated with the well-drained Princeton soils on knolls and ridges and with the very poorly drained Rensselaer soils in depressions.

TABLE 1.—*Approximate acreage and proportionate extent of soils*

Soil	Area	Extent
	Acres	*Percent*
Ayrshire fine sandy loam	330	0. 1
Brookston silty clay loam	43, 415	16. 6
Corydon stony silt loam, 18 to 35 percent slopes	331	. 1
Crosby silt loam, 0 to 2 percent slopes	71, 639	27. 3
Crosby silt loam, 2 to 4 percent slopes	14, 443	5. 5
Crosby-Miami silt loams, 0 to 6 percent slopes	5, 552	2. 1
Eel silt loam	2, 047	. 8
Fox loam, 0 to 2 percent slopes	7, 928	3. 0
Fox loam, 2 to 6 percent slopes, eroded	3, 435	1. 3
Fox loam, 6 to 12 percent slopes, eroded	308	. 1
Fox loam, 12 to 18 percent slopes, eroded	256	. 1
Fox loam, loamy substratum, 0 to 3 percent slopes	448	. 2
Fox clay loam, 2 to 6 percent slopes, severely eroded	302	. 1
Fox clay loam, 6 to 12 percent slopes, severely eroded	1, 163	. 4
Genesee loam	6, 209	2. 4
Genesee sandy loam, sandy variant	398	. 1
Gravel pits	324	. 1
Hennepin loam, 18 to 25 percent slopes	1, 666	. 6
Hennepin loam, 25 to 50 percent slopes	2, 421	. 9
Kokomo silty clay loam	474	. 2
Linwood muck	113	(1)
Martinsville loam, 0 to 2 percent slopes	2, 440	. 9
Martinsville loam, 2 to 6 percent slopes, eroded	763	. 3
Medway silt loam	2, 126	. 8
Miami silt loam, 2 to 6 percent slopes, eroded	12, 405	4. 7
Miami silt loam, 6 to 12 percent slopes, eroded	2, 189	. 8
Miami silt loam, 12 to 18 percent slopes, eroded	611	. 2
Miami clay loam, 2 to 6 percent slopes, severely eroded	2, 298	. 9
Miami clay loam, 6 to 12 percent slopes, severely eroded	9, 386	3. 5
Miami clay loam, 12 to 18 percent slopes, severely eroded	2, 810	1. 1
Miami-Crosby silt loams, 0 to 6 percent slopes	2, 944	1. 2
Millsdale silty clay loam	195	. 1
Milton silt loam, 1 to 6 percent slopes	373	. 1
Negley loam, 12 to 18 percent slopes, eroded	267	. 1
Negley loam, 18 to 25 percent slopes	196	. 1
Nineveh loam, 0 to 2 percent slopes	7, 402	2. 8
Nineveh loam, 2 to 6 percent slopes	1, 657	. 6
Ockley loam, 0 to 2 percent slopes	2, 852	1. 9
Parke silt loam, 2 to 6 percent slopes, eroded	301	. 1
Parke silt loam, 6 to 12 percent slopes, eroded	386	. 1
Princeton fine sandy loam, 0 to 2 percent slopes	252	. 1
Princeton fine sandy loam, 2 to 6 percent slopes	1, 136	. 4
Princeton fine sandy loam, 6 to 12 percent slopes	1, 295	. 5
Quarries	255	. 1
Randolph silt loam	378	. 1
Rensselaer clay loam	1, 936	. 7
Rodman gravelly loam, 18 to 35 percent slopes	309	. 1
Ross silt loam	5, 476	2. 1
Ross loam, moderately deep variant	580	. 2
Saranac silty clay loam	1, 778	. 7
Sebewa clay loam	780	. 3
Shoals silt loam	7, 143	2. 7
Sleeth loam	6, 295	2. 4
Westland clay loam	15, 700	6. 0
Westland and Brookston loams, overwash	830	. 3
Whitaker loam	1, 946	. 7
Water: water-filled borrow pits and quarries, lakes, and ponds	868	. 3
Total	261, 760	100. 0

[1] Less than 0.05 percent.

Ayrshire fine sandy loam (0 to 2 percent slopes) (Ay).—This nearly level soil is usually adjacent to or surrounded by dune-shaped areas of Princeton soils. This soil is in an irregularly shaped pattern and ranges in size from 4 to 20 acres.

Included in mapping are small areas of moderately well drained soils that are mottled at a depth of 18 to 30 inches. Also included are a few small areas of well-drained Princeton soils and very poorly drained Rensselaer soils. In places a buried soil is included that has till or outwash material at a depth below 45 inches.

Runoff is slow or very slow. Wetness is the main limitation. If adequately drained and properly managed, this soil is suited to all crops common in the county. (Capability unit IIw–2).

Brookston Series

The Brookston series consists of deep, very poorly drained soils. These soils occupy depressional areas, swales, and narrow drainageways of the upland till plains. The native vegetation was water-tolerant hardwoods and shrubs and some sedges and grasses.

In a representative profile, the surface layer is about 16 inches of very dark gray silty clay loam. The subsoil is about 28 inches thick. The upper 16 inches is firm, gray silty clay loam that has dark yellowish-brown and olive-brown mottles. The lower 12 inches is firm, gray silty clay loam and clay loam that has yellowish-brown mottles. The underlying material is at a depth of about 44 inches and consists of gray and yellowish-brown, calcareous heavy clay loam till.

Brookston soils have naturally high organic-matter content and are slightly acid or neutral. These slowly permeable soils have a high available moisture capacity. The main limitation is excessive wetness. The seasonal high water table is near the surface, and during wet seasons, water may pond on the surface. Most areas are cultivated, except for small areas that are still forested.

Representative profile of Brookston silty clay loam, in a cultivated field 250 feet south of old U.S. Highway 421 and 400 feet north and 570 feet west of the southeast corner of the NW¼ sec. 11, T. 12 N., R. 7 E.

Ap—0 to 9 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, granular structure; firm when moist; neutral; abrupt, smooth boundary.

A12—9 to 16 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, subangular blocky structure; firm when moist; black (10YR 2/1) films on faces of peds; few worm casts and root holes 1 to 2 millimeters in diameter; neutral; clear, smooth boundary.

B21tg—16 to 32 inches, gray (5Y 5/1) silty clay loam; common, fine, distinct, dark yellowish-brown (10YR

4/4) and olive-brown (2.5Y 4/4) mottles; weak, medium, prismatic structure breaking to strong, medium and coarse, angular and subangular blocky; firm when moist; gray (5Y 5/1) clay films on all faces of peds; voids 1 to 2 millimeters in diameter; neutral; clear, wavy boundary.

B22tg—32 to 40 inches, gray (5Y 5/1) silty clay loam; many, medium, prominent, yellowish-brown (10YR 5/6) mottles; weak, coarse, prismatic structure breaking to moderate, medium and coarse, angular and subangular blocky; firm when moist; few pebbles 1 to 5 millimeters in diameter; gray (5Y 5/1) clay films on all faces of peds; neutral; clear, wavy boundary.

B3g—40 to 44 inches, gray (5Y 5/1) clay loam; many, coarse, prominent, yellowish-brown (10YR 5/6 and 5/8) mottles; moderate, coarse, subangular blocky structure; firm when moist; few pebbles 2 to 10 millimeters in diameter; gray (5Y 5/1) clay films on some faces of peds; neutral; gradual, wavy boundary.

Cg—44 to 60 inches, gray (5Y 5/1) and yellowish-brown (10YR 5/6 and 5/8) heavy clay loam; massive; friable when moist; calcareous; moderately alkaline.

The A horizon ranges from 11 to 20 inches in thickness and from black (10YR 2/1) to very dark grayish brown (10YR 3/2) in color. There is a gray (10YR 5/1) or dark-gray (10YR 4/1) silty clay loam or clay loam B1g horizon in some areas. The B2 horizon ranges from dark gray (10YR 4/1) to olive gray (5Y 5/2) in color and from clay loam to silty clay loam that is more than 15 percent sand in texture. The B3 horizon is lacking in some places. The B3 horizon ranges from loam to clay loam. The Ap, A12, B21tg, and B22tg horizons generally contain enough sand to have a gritty feel. The C horizon is loam or clay loam and is more compact with increasing depth. The solum ranges from 30 to 50 inches thick but is mainly 36 to 44 inches thick.

The Brookston, Westland, and Rensselaer soils are on similar landscapes and have profiles of similar thickness. The Brookston soils have fewer pebbles throughout the profile than the Westland soils, which developed in loamy material over stratified gravel and sand. They contain less sand and more pebbles than the Rensselaer soils, which developed in stratified sand and silt. The very poorly drained Brookston soils are closely associated on the landscape with the somewhat poorly drained, nearly level and gently sloping Crosby soils and the well-drained, gently sloping to moderately steep Miami soils on knolls and hillsides.

Brookston silty clay loam (0 to 2 percent slopes) (Br).—This soil is in broad depressional areas, swales, and narrow drainageways on uplands. The soil areas are irregularly shaped and range from a few acres to more than 80 acres in size.

Included in mapping are small areas that have a silt loam surface layer. Also included are a few small areas where the subsoil developed in stratified material and has some strata of light silty clay. Also included are small areas of Crosby soils. In built-up areas there is as much as 3 to 4 feet of fill material over the original soil. In some places used for construction, the upper part of the soil has been reworked.

Wetness is the main limitation to the use and management of this soil. Runoff is slow or very slow, and there is little hazard of erosion. This soil, if worked when too wet, is subject to puddling and becomes hard and cloddy upon drying. If adequately drained and well managed, it is suited to most crops common in the county. Corn and soybeans are the main crops. (Capability unit IIw-1).

Corydon Series

The Corydon series consists of shallow, well-drained, steep and very steep stony soils. These soils formed in material weathered from limestone and are underlain at a depth of 10 to 20 inches by limestone bedrock. They are on uplands. The native vegetation was mixed hardwoods.

In a representative profile, the surface layer is very dark grayish-brown stony silt loam about 7 inches thick. The subsoil is about 8 inches of clay that is reddish brown in the upper 5 inches and dark brown in the lower part. There are many stones mixed through the subsoil. The underlying limestone is at a depth of 15 inches. Material from the subsoil is in some cracks to a depth of about 24 inches.

Corydon soils have moderately slow permeability and a low available moisture capacity. They are slightly acid to neutral and are moderate to high in organic-matter content. Runoff, erosion, and droughtiness are the main limitations. Most areas are wooded, but some areas are in permanent pasture.

Representative profile of Corydon stony silt loam, 18 to 35 percent slopes, in a wooded area, 400 feet south and 400 feet east of the northwest corner of the SE¼ sec. 9, T. 11 N., R. 8 E.

A—0 to 7 inches, very dark grayish-brown (10YR 3/2) stony silt loam; moderate, medium, granular structure; friable when moist; abundant roots; many stones on the surface; neutral; abrupt, wavy boundary.

B21t—7 to 12 inches, reddish-brown (5YR 4/4) stony clay; moderate, medium, subangular blocky structure; very firm when moist; dark reddish-brown (5YR 3/2 and 3/3) clay films on ped faces; several stones; neutral; clear, wavy boundary.

B22t—12 to 15 inches, dark-brown (7.5YR 4/4) stony clay; moderate, fine, angular blocky structure; very firm when moist; patches of dark reddish-brown (5YR 3/2 and 3/3) clay films on some peds; decomposing limestone rocks; calcareous; moderately alkaline; abrupt, irregular boundary.

R—15 inches +, gray limestone bedrock that contains numerous cracks filled with weathering soil material; some cracks extend to a depth of 24 inches or more.

The solum ranges from 10 to 20 inches in thickness. The A horizon ranges from dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2) in color and from 3 to 8 inches in thickness. The B horizon ranges from 5 to 15 inches in thickness, from silty clay to clay in texture, and from reddish brown (5YR 4/4) to dark brown (10YR 4/3) in color.

Corydon soils are on similar terrain to that occupied by Hennepin and Rodman soils. Corydon soils contain stones throughout the soil and have finer textured material in the subsoil than Hennepin soils, which developed in loam till, or Rodman soils, which developed in stratified gravel and sand. The well-drained Corydon soils are closely associated on the landscape with the nearly level, somewhat poorly drained Randolph soils and the gently sloping, well-drained Milton soils.

Corydon stony silt loam, 18 to 35 percent slopes (CoE).—This soil is steep and very steep and is underlain by limestone bedrock. About 5 to 15 percent of this unit consists of limestone outcrops (fig. 8).

Included in mapping are a few areas of colluvial soil at the base of the slopes. Some moderately steep areas that have only a few outcroppings of stone are included. Also included are soils that have been plowed or eroded and have a surface color of brown or dark brown.

Runoff is rapid to very rapid. Runoff, erosion, and droughtiness are the main limitations to use and management of this soil. Shallow soil depth, slope, and stoniness also limit use and management. This soil is not suited to row crops but can be used for permanent pasture or trees. Permanent vegetative cover is needed to control erosion. (Capability unit VIIe-2)

Figure 8.—Outcropping of limestone bedrock in an area of Corydon stony silt loam, 18 to 35 percent slopes.

Crosby Series

The Crosby series consists of deep, somewhat poorly drained soils. These soils formed in thin loess and glacial till. They are nearly level and gently sloping and are on uplands. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 8 inches of dark grayish-brown silt loam. The subsurface layer is about 3 inches of grayish-brown silt loam. The subsoil is about 23 inches of firm clay loam that is grayish brown in the upper 13 inches and brown in the lower part. It is mottled with yellowish brown, grayish brown, and brown. The underlying material is at a depth of about 34 inches and consists of brown, yellowish-brown, and grayish-brown, calcareous loam till.

Crosby soils have a high available moisture capacity and slow permeability. The surface layer is medium acid unless it has been limed. Crosby soils are naturally low in organic-matter content. Excessive wetness is the main limitation. In wet seasons, the water table is at a depth of 1 to 3 feet. Most areas are cultivated, but a few small areas are used for permanent pasture and small woodlots.

Representative profile of Crosby silt loam, 0 to 2 percent slopes, in a cultivated field 100 feet west and 160 feet south of the northeast corner of sec. 24, T. 13 N., R. 7 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; cloddy and weak, medium, granular structure; friable when moist; common 1- to 2-millimeter voids; few worm casts; neutral; abrupt, smooth boundary.

A2—8 to 11 inches, grayish-brown (10YR 5/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/4 and 5/6) and light brownish-gray (10YR 6/2) mottles; moderate, medium, granular structure; friable when moist; common 1- to 2-millimeter voids; few wormholes; few very fine voids less than 1 millimeter in diameter; neutral; clear, smooth boundary.

B1—11 to 16 inches, grayish-brown (10YR 5/2) light clay loam; many, medium, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; weak, medium, subangular blocky structure; slightly firm when moist; few, patchy, dark grayish-brown clay films; few black (10YR 2/1) concretions; few wormholes filled

with dark grayish-brown (10YR 4/2) material; slightly acid; clear, smooth boundary.

B21t—16 to 24 inches, grayish-brown (10YR 5/2) clay loam; many, medium, distinct, yellowish-brown (10YR 5/4) and brown (10YR 5/3) mottles; moderate, medium, subangular blocky structure; firm when moist; dark-gray (10YR 4/1) clay films continuous on faces of peds; common black blotches; medium acid; gradual, smooth boundary.

B22t—24 to 34 inches, brown (10YR 5/3) clay loam; many, medium, distinct, yellowish-brown (10YR 5/4), grayish-brown (10YR 5/2), and grayish-brown (2.5Y 5/2) mottles; moderate, coarse, subangular blocky structure; firm when moist; dark-gray (10YR 4/1) clay films continuous on faces of peds; common black (10YR 2/1) concretions; few wormholes; slightly acid; clear, wavy boundary.

R—34 to 45 inches, brown (10YR 5/3), grayish-brown (10YR 5/2), and yellowish-brown (10YR 5/6) loam till; massive and friable, becoming more dense with increasing depth; moderately alkaline; calcareous.

The solum ranges from 24 to 42 inches in thickness but is mainly 28 to 38 inches thick. The Ap horizon ranges from dark gray (10YR 4/1) to grayish brown (10YR 5/2) in color and from 4 to 9 inches in thickness. In some areas material from the A2 horizon has been mixed into the Ap horizon by deep plowing. The Ap and A2 horizons generally contain enough sand to have a gritty feel. The depth to mottling ranges from 12 to 18 inches. The B2 horizon ranges in texture from clay loam to silty clay loam that is more than 15 percent sand. Color ranges from grayish brown (10YR 5/2) to dark yellowish brown (10YR 4/4) with dark-gray (10YR 4/1) and grayish-brown (2.5Y 5/2) mottles in the horizons that have chromas of more than 2. The subsoil ranges in reaction from slightly acid to strongly acid. The loess is about 10 to 18 inches thick, but is mainly about 14 inches thick.

Crosby soils are on similar terrain to that occupied by Whitaker, Ayrshire, and Sleeth soils. Crosby soils contain less sand and have a thinner solum than the Ayrshire and Whitaker soils, which developed in fine sand and silt. They have a thinner solum and fewer pebbles throughout the profile than Sleeth soils, which are underlain by sand and gravel. The somewhat poorly drained Crosby soils are closely associated on the landscape with the very poorly drained Brookston soils in depressions and the well-drained Miami soils on knolls and hillsides.

Crosby silt loam, 0 to 2 percent slopes (CrA).—This somewhat poorly drained, nearly level soil is on broad flats and slightly undulating areas on uplands. In rolling areas this soil is on the ridgetops. The soil areas are irregularly shaped and range from a few acres to more than 100 acres in size. This soil has the profile described as representative for the series.

Included in mapping are areas that have a surface layer of loam and small areas where slopes are short and gentle. Also included are small areas of Brookston soils in narrow, elongated drainageways and small areas of Miami soils on small knolls and breaks. Included in the western part of the county are soils that developed in a smear of windblown sand, 18 to 30 inches thick, over till. These soils have a surface layer of loam and, in small areas, of fine sandy loam. Included near Pleasant View are soils that have a finer textured subsoil and a somewhat thinner solum than that described in the representative profile. Soils in this area dry more slowly than similar soils in other parts of the county, thus delaying fieldwork. Within built-up areas there is as much as 2 to 3 feet of fill over the original soil. In some places the upper part of the soil has been reworked during construction.

Wetness is the main limitation to the use of this soil. Runoff is slow. If adequately drained, fertilized, and managed, this soil is suited to most crops common in the county. The main row crops are corn and soybeans. (Capability unit IIw–2)

Crosby silt loam, 2 to 4 percent slopes (CrB).—This gently sloping soil is on narrow breaks, low knolls, ridgetops, and areas at the heads of drainageways. In places it is gently undulating. Most areas have short slopes. Areas of this soil range in size from 3 to 20 acres. In a few areas the plow layer contains a moderate amount of material from the subsoil mixed with material from the original surface layer.

Included in mapping are small areas of Brookston soils and Miami soils. Included near Pleasant View are soils that have a finer textured subsoil and a somewhat thinner solum. Soils in this area dry more slowly than similar soils in other parts of the county, thus delaying fieldwork.

Wetness is the main limitation to use and management of this soil and erosion is the main hazard. Runoff is slow. Erosion control practices are needed on some slopes. If adequately drained, fertilized, and managed, this soil is suited to most crops common in the county. (Capability unit IIe–12)

Crosby-Miami silt loams, 0 to 6 percent slopes (CsB).—This complex consists of somewhat poorly drained and well-drained soils that are too small to map separately. The complex is about 60 percent Crosby soils, 25 percent Miami soils, and 15 percent other soils. In areas where slopes are uniform, the Crosby soils are on the lower and upper parts of the slopes, and the Miami soils occupy the central part. In hummocky areas the Crosby soils occupy the lower knolls and ridges and are on the lower part of higher knolls and ridges, and the Miami soils are on the upper part of the higher knolls and ridges.

The profile for the Crosby silt loam is similar to the one described as representative for the series, except that in places part of the original surface layer has been removed by erosion. The profile for the Miami silt loam is similar to the one described as representative for the series, except that in places the plow layer contains a moderate amount of material from the subsoil mixed with the original surface layer. On some of the higher knolls, the subsoil is exposed. In some of the low areas, 6 to 12 inches of silty material has been deposited on the surface.

Included in mapping are small areas of alluvial soils in low areas between ridges and knolls. In some drainageways there are small, elongated areas of Brookston soils.

Use of the Crosby soil is limited by wetness. There is an erosion hazard on all of the knolls and ridges. In the hummocky areas water ponds in some of the low, marshy kettleholes. In hummocky areas the terrain is so irregular that such practices as minimum tillage or use of grass in rotation with crops are used to help control erosion. In these areas it is difficult to establish an adequate outlet for drainage systems.

If these soils are adequately drained and properly managed and erosion is controlled, they are suited to most crops common in the county. (Capability unit IIe–12)

Eel Series

The Eel series consists of deep, moderately well drained soils that formed in neutral to moderately alkaline alluvial material. These soils are on flood plains of the major streams and their tributaries and on narrow

flood plains that extend into the uplands. The native vegetation was hardwood forest.

In a representative profile, the surface layer is about 8 inches of dark grayish-brown silt loam. The moderately alkaline subsoil is about 22 inches of friable loam that is dark brown in the upper part and brown in the lower part. The underlying material begins at a depth of about 30 inches. It consists of calcareous, moderately alkaline, brown stratified loam, sandy loam, and gravelly loam mottled with yellowish brown and grayish brown.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderate. Reaction is neutral to moderately alkaline.

Eel soils are subject to flooding in winter and early in spring and to occasional flooding during the growing season. Wetness is a moderate limitation to farming. Most of the acreage is used for crops. Small areas are in permanent pasture and woodland.

Representative profile of Eel silt loam, in a cultivated field 320 feet west and 160 feet north of the southeast corner of sec. 17, T. 12 N., R. 8 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable when moist; few worm casts; abundant roots; mildly alkaline; abrupt, smooth boundary.

B21—8 to 14 inches, dark-brown (10YR 4/3) loam; weak, medium, granular structure; friable when moist; few roots; few worm casts; calcareous; moderately alkaline; clear, smooth boundary.

B22—14 to 19 inches, dark-brown (10YR 4/3) loam; weak, fine, subangular blocky structure; friable when moist; some coatings of dark brown (10YR 3/3) on ped faces; few worm casts; 1- to 3-millimeter voids; calcareous; moderately alkaline; clear, smooth boundary.

B23—19 to 30 inches, brown (10YR 5/3) loam; common, medium, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; friable when moist; some dark-brown (10YR 3/3) coatings on ped faces; few 1- to 3-millimeter voids; few roots; calcareous; moderately alkaline; clear, smooth boundary.

C—30 to 42 inches, brown (10YR 5/3) stratified loam, sandy loam, and gravelly loam; many, medium, distinct, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles; massive; friable when moist; calcareous; moderately alkaline.

The solum ranges from 24 to 40 inches in thickness. The depth to mottles ranges from 16 to 24 inches. The color of the Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 5/3). In wooded areas the A1 horizon is mainly very dark grayish brown (10YR 3/2) in color and ranges in thickness from 1 to 5 inches. The B2 horizon ranges in color from dark brown (10YR 4/3) to pale brown (10YR 6/3) and dark yellowish brown (10YR 4/4) and in texture from loam to light clay loam or sandy loam. Texture of the underlying material is loam, sandy loam, gravelly loam, and clay loam. In places there is loose gravel and sand at a depth below 48 to 60 inches.

Eel, Medway, Shoals, and Genesee soils are in similar positions on the landscape. Eel soils have a lighter colored surface layer than Medway soils. They are mottled at a greater depth than Shoals soils and at a lesser depth than Genesee soils. The moderately well drained Eel soils are closely associated on the landscape with the somewhat poorly drained Shoals soils and the well-drained Genesee soils.

Eel silt loam (0 to 2 percent slopes) (Ee).—This medium-textured soil is on wide flood plains and on some narrow flood plains that extend into uplands. Areas of this soil are 5 to 10 acres in size. In wooded areas the surface layer is 1 to 5 inches thick and is very dark grayish brown.

Included in mapping are some soils that have a loam surface layer. Small areas that have a fine sandy loam or silty clay loam surface layer are also included. In narrow bottom lands, small areas of well-drained Genesee soils are included near streams. Shoals and Saranac soils are included in small, low, wet areas.

Most of this soil is used for crops. Corn and soybeans are the main row crops. Most narrow bottom lands that are irregularly dissected by meandering stream channels are used for pasture or woodland.

This soil is fertile and easy to cultivate. It is subject to flooding in winter and early in spring and to occasional flooding during the growing season. Use of this soil is moderately limited by wetness. Runoff is slow or very slow. If adequately drained and fertilized and properly managed, this soil is suited to most crops grown locally. Winter grains are damaged by flooding. (Capability unit I-2)

Fox Series

The Fox series consists of well-drained soils that are moderately deep over calcareous, stratified gravel and sand. These soils formed in loamy material. Depth to the underlying loose, calcareous gravel and sand is 24 to 42 inches. The nearly level to moderately steep Fox soils are on terraces along the major streams, on the kames near Marietta, and on the high rolling ridges in Jackson Township. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 8 inches of brown loam. The subsoil is about 26 inches thick. The upper 5 inches is dark yellowish-brown, friable loam. The middle 17 inches is dark-brown clay loam and dark reddish-brown gravelly clay loam. Below a depth of 30 inches the subsoil is dark reddish-brown gravelly clay loam to gravelly clay. Tongues of this material extend 5 to 20 inches into the underlying calcareous sand and gravel, which begins at a depth of 34 inches (fig. 9).

These Fox soils are moderately permeable in the subsoil and very rapidly permeable in the underlying material. They have a low to moderate available moisture capacity. The organic-matter content is naturally low.

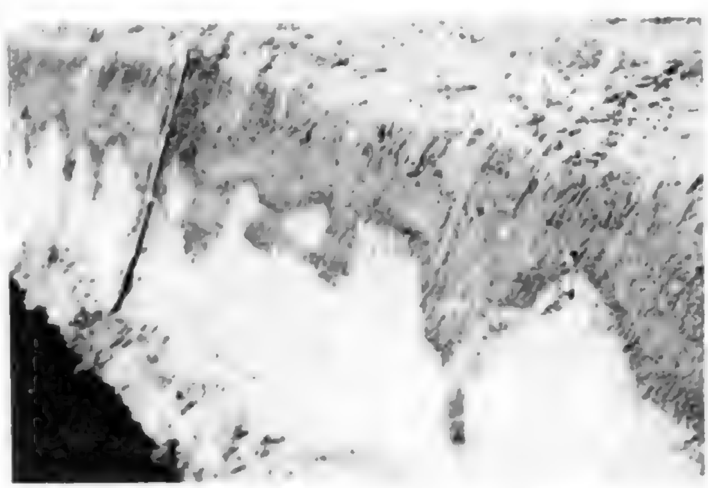

Figure 9.—Profile of Fox loam shows dark-colored tongues extending from the subsoil into the underlying gravel and sand.

The surface layer is medium acid unless it has been limed. These soils are droughty during long dry seasons. Most areas are used for crops, but some areas, mainly those of sloping to moderately steep soils, are used for permanent pasture and woodland.

Representative profile of Fox loam, 0 to 2 percent slopes, in a cultivated field 740 feet east and 680 feet north of the southwest corner of the NW¼ sec. 35, T. 13 N., R. 6 E.

Ap—0 to 8 inches, brown (10YR 4/3) loam, pale brown (10YR 6/3) when dry; weak, fine and medium, granular structure; friable when moist; few pebbles up to 1 inch in diameter; neutral; abrupt, smooth boundary.

B1—8 to 13 inches, dark yellowish-brown (10YR 4/4) loam; weak, medium, subangular blocky structure; friable when moist; dark-brown (10YR 3/3) coatings on some faces of peds; neutral; clear, smooth boundary.

B21t—13 to 19 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films continuous on faces of peds and small pebbles; neutral; clear, smooth boundary.

B22t—19 to 30 inches, dark reddish-brown (5YR 3/3) gravelly clay loam; moderate, coarse, subangular blocky structure and some medium subangular blocky; firm when moist; dark reddish-brown (5YR 3/2) clay films continuous on faces of peds and on all pebbles; all sand grains bridged with clay; slightly acid; clear, wavy boundary.

B23t—30 to 34 inches, dark reddish-brown (5YR 3/2) gravelly heavy clay loam to gravelly light clay; weak, coarse, angular blocky structure; firm when moist; dark reddish-brown (5YR 2/2 and 3/2) clay films on faces of peds and on pebbles; tongues of this horizon extend 5 to 20 inches into the C horizon; decomposing dolomite pebbles are common in the tongues; neutral; abrupt, irregular boundary.

C—34 to 76 inches, brown (10YR 5/3) to light brownish-gray (10YR 6/2) with some light-gray (10YR 7/2) stratified sand and gravel; loose; calcareous; moderately alkaline.

The solum ranges from 24 to 42 inches thick. The color of the Ap horizon ranges from brown (10YR 4/3) to brown (10YR 5/3). There is a brown (10YR 5/3) silt loam or loam A2 horizon in some areas. The B2t horizon ranges from silty clay loam to gravelly clay loam, but is mainly clay loam in the upper part and gravelly clay loam in the lower part. Tongues of B2 horizon extend to as deep as 48 inches and range from 2 to 3 feet apart to about 8 feet apart.

Fox, Nineveh, and Ockley soils occupy similar positions on the landscape. Fox soils have a lighter colored surface layer than Nineveh soils. They have a thinner solum than Ockley soils, which are underlain by loose gravel and sand at a depth of 42 to 60 inches. The well-drained Fox soils are closely associated with the very poorly drained Westland soils in depressions and with the somewhat poorly drained Sleeth soils on flood plains.

Fox loam, 0 to 2 percent slopes (FoA).—This nearly level soil is on terraces along the major streams of the county. These terraces are 4 to 20 feet above the adjacent flood plains. The soil areas range in size from 4 acres to more than 80 acres. This soil has the profile described as representative for the series. In places 30 to 50 percent of the soil consists of tongues of material from the subsoil that extend as deep as 48 inches into the underlying gravel and sand. In areas where this soil grades to Nineveh soils, the surface layer is somewhat darker and, in places, the subsoil is neutral in reaction.

Included in mapping are small areas of soil that have a gritty silt loam, fine sandy loam, and gravelly loam surface layer. Small areas of somewhat poorly drained and poorly drained soils are included in some of the narrow remnants of old stream channels. Also included are a few, small, elongated, gently undulating soils on ridges.

Runoff is slow. This soil is droughty during dry seasons. It is suited to all crops common in the county. Deep-rooted crops, such as alfalfa and fall-seeded small grains, are better suited than crops that would probably be damaged if rainfall were below normal. A few areas are used for strawberries, tomatoes, and potatoes. This soil is suitable for irrigation. (Capabibility unit IIs–1)

Fox loam, 2 to 6 percent slopes, eroded (FoB2).—This gently sloping, eroded soil is on narrow elongated ridges, gently undulating areas, and along narrow breaks from the nearly level terraces to the lower lying flood plains. Slopes are short and are very irregularly shaped. This soil is generally intermixed with Fox loam, 0 to 2 percent slopes. The areas range in size from 3 to 20 acres.

This soil has a profile similar to that described as representative for the series, except that it has a somewhat thinner solum and part of the original surface layer has been removed by erosion. The present surface layer consists of a mixture of material from the original surface layer and a moderate amount of material from the dark yellowish-brown and dark-brown subsoil. There are commonly pebbles on the surface. Depth to the underlying loose gravel and sand is 24 to 34 inches. There are only a few tongues of subsoil material that extend into the underlying material.

Included in mapping are small areas of soils that have loose gravel and sand at a depth of less than 24 inches. Also included are small areas of soils that have a fine sandy loam and gravelly loam surface layer. A few small areas of severely eroded soils and soils that have slopes of 6 to 12 percent are also included.

Runoff is slow to medium. Erosion is a hazard. This soil is droughty during periods of low rainfall. It is suited to cultivated crops common in the county. The main crops are corn, soybeans, wheat, and alfalfa. Crops grown on this soil are affected by dry weather earlier than crops on Fox loam, 0 to 2 percent slopes. A few areas of this soil are used for strawberries and tomatoes. This soil is well suited to irrigation. (Capability unit IIe–9)

Fox loam, 6 to 12 percent slopes, eroded (FoC2).—This eroded, sloping soil is irregular in shape and has short slopes. It is on terraces. The areas of this soil range from 3 to 15 acres in size. This soil has a profile similar to that described as representative for the series, except that it has a somewhat thinner solum and part of the original surface layer has been removed by erosion. The present surface layer consists of a mixture of material from the original surface layer and a moderate amount of material from the dark-brown clay loam subsoil. Depth to the underlying gravel and sand is mainly 24 to 36 inches.

Included in mapping are small areas that have a gravelly loam surface layer and a few, small, severely eroded areas. Also included are a few soils that have gravel and sand at a depth of less than 24 inches. Included on the kames near Marietta are a few small areas of Miami soils. Included on the high ridges in Jackson Township are a few small areas of Miami and Parke soils, and in places there are a few chunks of cemented gravel on or near the surface.

Runoff is medium or rapid. This soil is droughty during dry seasons, and there is also an erosion hazard. On kames and high ridges in Jackson Township, this soil is not so droughty as on the stream terrace breaks. This soil is suited to all crops common in the county, but it is better suited to such deep-rooted crops as alfalfa and fall-seeded small grains than to such crops as corn and soybeans that would likely be damaged if rainfall were below normal. (Capability unit IIIe–9)

Fox loam, 12 to 18 percent slopes, eroded (FoD2).—This moderately steep, eroded soil is on terrace breaks or hillsides along the terraces. The slopes are short and irregularly shaped. This soil has a profile similar to that described as representative for the series, except that it has a somewhat thinner solum and in places part of the surface layer has been removed by erosion. The present surface layer consists of a mixture of material from the original surface layer and a moderate amount of material from the dark-brown clay loam subsoil. Depth to the underlying gravel and sand is mainly 24 to 30 inches.

Included in mapping are soils that have loose sand and gravel at a depth of less than 24 inches. Included are some small areas of soils that are severely eroded. Also included are a few small areas of steeper Rodman soils. On the kames near Marietta are small included areas of Miami and Hennepin soils. On the high ridge in Jackson Township there are small included areas of Miami and Negley soils, and in this area there are a few large chunks of cemented gravel on or near the surface.

Runoff is rapid. This soil is droughty, and there is an erosion hazard. It is not so droughty on the kames and on the high ridges in Jackson Township as on the stream terrace breaks. This soil is suited to all cultivated crops common in the county if erosion and other hazards are controlled. It is better suited to deep-rooted crops, such as alfalfa and fall-seeded small grains, than to such crops as corn and soybeans that would likely be damaged if rainfall were below normal. (Capability unit IVe–9)

Fox loam, loamy substratum, 0 to 3 percent slopes (FsA).—This nearly level to gently sloping soil is in areas of stream terraces that have a thin layer of gravel and sand deposited on calcareous, moderately alkaline loam till. This soil has a profile similar to that described as representative for the series, except that there is only a thin layer of gravel and sand between the subsoil and the underlying loam till. The thickness of the loose gravel and sand layer between the subsoil and the underlying till ranges from 0 to 20 inches but is dominantly 8 to 15 inches. In places roots extend through the loose sand into the underlying till.

Included in mapping are small areas of somewhat poorly drained and poorly drained soils.

This moderately permeable soil has a moderate or high available moisture capacity. Runoff is slow. This soil is somewhat droughty during very long dry seasons. It is suited to all cultivated crops common in the county. Crops grown on this soil are less likely to be damaged by dry weather than crops grown on other Fox soils. This soil is suited to irrigation. (Capability unit IIs–1)

Fox clay loam, 2 to 6 percent slopes, severely eroded (FxB3).—This gently sloping, severely eroded soil occupies short breaks and narrow, elongated ridges in areas of nearly level Fox and Nineveh soils. This soil has a profile similar to the one described as representative for the series, except that it has a somewhat thinner solum and most of the original surface layer has been removed by erosion. The present surface layer consists mainly of material from the dark-brown clay loam subsoil. Depth to the underlying loose gravel and sand is 24 to 30 inches.

Included in mapping are small areas of soils that have a loam and gravelly clay loam surface layer. In places soils are included that have loose gravel and sand at a depth of less than 24 inches.

Runoff is slow to medium. Erosion is a hazard, and droughtiness limits the use and management of this soil. This soil is suited to all crops common in the county, but it is better suited to such deep-rooted crops as alfalfa and fall-seeded small grains than to such crops as corn and soybeans that would likely be damaged if rainfall were below normal. Crops grown on this soil are affected by dry weather earlier than crops grown on Fox loam, 0 to 2 percent slopes. This soil is suited to irrigation. (Capability unit IIIe–9)

Fox clay loam, 6 to 12 percent slopes, severely eroded (FxC3).—This severely eroded soil is on the terrace breaks. Slopes are short and irregularly shaped. The soil areas range in size from 3 to 10 acres. This soil has a profile similar to the one described as representative for the series, except that it has a somewhat thinner solum and the original surface layer has been removed by erosion. The present surface layer consists mainly of material from the dark-brown clay loam subsoil. Depth to the underlying gravel and sand is mainly 24 to 30 inches.

Included in mapping are soils that have loose sand and gravel at a depth of less than 24 inches. Small areas of this soil have a gravelly clay loam surface layer. On the kames near Marietta, small areas of Miami soils are included. On the high ridges in Jackson Township, a few chunks of cemented gravel are on or near the surface, and in a few small areas Parke and Miami soils are also included.

Runoff is medium or rapid. This soil is droughty during dry seasons. There is an erosion hazard. On kames and high ridges in Jackson Township, this soil is not so droughty as on the stream terrace breaks. If erosion and other hazards are controlled, this soil is suited to cultivated crops common in the county. It is better suited to such deep-rooted crops as alfalfa or fall-seeded small grains than to corn and soybeans, which would likely be damaged if rainfall were below normal. (Capability unit IVe–9)

Genesee Series

The Genesee series consists of deep, well-drained soils on flood plains. These soils occupy the nearly level areas adjacent to the major drainageways. They formed in alluvium washed from areas of calcareous glacial till. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 10 inches of dark-brown loam. The subsoil is about 16 inches of calcareous, moderately alkaline, brown friable loam. The underlying material is at a depth of about 26 inches and consists of calcareous, moderately alkaline, brown stratified loam, sandy loam, and gravelly loam.

Genesee soils have moderate organic-matter content. They are neutral to moderately alkaline. They have a

high available moisture capacity and moderate permeability. These soils are subject to flooding during winter and early in spring.

Most areas are used for corn and soybeans. Some areas that are small or cut up by old stream channels are in trees or permanent pasture.

Representative profile of Genesee loam, in a cultivated field 100 feet west and 100 feet north of the southeast corner of sec. 17, T. 12 N., R. 8 E.

Ap—0 to 10 inches, dark-brown (10YR 3/3) loam, brown (10YR 4/3) when rubbed; moderate, medium, granular structure; friable when moist; abundant roots; few very dark grayish-brown (10YR 3/2) worm casts; few snail shells; calcareous; mildly alkaline; abrupt, smooth boundary.

B21—10 to 20 inches, brown (10YR 4/3) loam; moderate, medium, granular structure; friable when moist; few dark-brown (10YR 3/3) worm casts; few 1- to 3-millimeter voids; some dark-brown (10YR 3/3) organic coatings on faces of peds; calcareous; moderately alkaline; clear, smooth boundary.

B22—20 to 26 inches, brown (10YR 4/3) loam; weak, fine, subangular blocky structure; friable when moist; few 1- to 3-millimeter voids; calcareous; moderately alkaline; clear, smooth boundary.

C1—26 to 35 inches, brown (10YR 4/3) heavy sandy loam or loam; massive; friable; calcareous; moderately alkaline; abrupt, smooth boundary.

C2—35 to 52 inches, brown (10YR 5/3) gravelly loam; common, medium, distinct, gray (10YR 5/1) mottles; massive; calcareous; moderately alkaline.

The solum ranges from 24 to 42 inches in thickness. The profile ranges from neutral to moderately alkaline in reaction in the upper part and from mildly alkaline to moderately alkaline in the lower part. The Ap horizon ranges from dark brown (10YR 3/3) to brown (10YR 5/3) in color. The B horizon is dominantly loam but ranges from light clay loam to sandy loam. The B horizon is dark yellowish brown (10YR 4/4), brown (10YR 5/3), or yellowish brown (10YR 5/3). The texture of the underlying material ranges from sandy loam to clay loam, and in places there is loose sand and gravel at a depth below 4 feet. In some areas mottles are below a depth of 30 inches.

The Genesee, Ross, and Eel soils occupy similar positions on the landscape. Genesee soils have a lighter colored surface layer than Ross soils. They are free of mottles above a depth of 30 inches, but Eel soils have mottles at a depth of 18 to 30 inches. The well drained Genesee soils are closely associated on the landscape with the moderately well drained Eel soils and the somewhat poorly drained Shoals soils.

Genesee loam (0 to 2 percent slopes) (Ge).—This well-drained, nearly level soil is on flood plains adjacent to major streams and their tributaries. On flood plains less than one-quarter mile wide, this soil commonly has mottles at a depth of 35 to 40 inches. In wooded areas the surface layer, 1 to 5 inches thick, is very dark grayish brown.

Included in mapping are areas that have a gritty silt loam surface layer. Some narrow, elongated natural levees are occupied by soils that have a fine sandy loam surface layer. Small areas of somewhat poorly drained Shoals soils or very poorly drained Saranac soils are included in narrow meander channels. A few soils that have a dark-colored surface layer 10 to 12 inches thick are also included in mapping.

Runoff is slow to very slow. The principal hazard is flooding during winter and early in spring. There is only an occasional flood of short duration during growing seasons. This soil is suited to corn, soybeans, and other annual row crops. Fall-seeded small grains are likely to be damaged by winter and spring flooding. In areas protected from flooding or where flooding is only occasional, this soil is suited to all crops common in the county. This soil is suited to hardwood trees, such as black walnut. (Capability unit I-2)

Genesee Series, Sandy Variant

The Genesee series, sandy variant, consists of well-drained soils that formed in sandy alluvium and are moderately deep over sand. These soils are nearly level and occupy areas and natural levees adjacent to the major drainageways. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 12 inches of dark grayish-brown sandy loam. The subsoil is about 13 inches of very friable, brown sandy loam. The underlying material is at a depth of about 25 inches and consists of light-gray and pale-brown loose sand and brown friable sandy loam.

These soils have low organic-matter content, low to moderate available moisture capacity, and moderately rapid permeability. They are mildly alkaline or moderately alkaline. These soils are subject to flooding during winter and early in spring. They are somewhat droughty during dry seasons. Most of the acreage is used for crops and some woodlots are on natural levees.

Representative profile of Genesee sandy loam, sandy variant, in a cultivated field 330 feet east and 1,070 feet south of the northwest corner of sec. 34, T. 11 N., R. 6 E.

Ap—0 to 12 inches, dark grayish-brown (10YR 4/2) sandy loam, pale brown (10YR 6/3) when dry; weak, medium, granular structure; very friable when moist; common ½- to 1-inch pebbles; calcareous; moderately alkaline; abrupt, smooth boundary.

B—12 to 25 inches, brown (10YR 4/3) sandy loam; weak, medium, granular structure; very friable when moist; common ½- to 1-inch pebbles; calcareous; moderately alkaline; abrupt, wavy boundary.

C1—25 to 28 inches, pale-brown (10YR 6/3) sand; single grain; loose; calcareous; moderately alkaline; abrupt, wavy boundary.

C2—28 to 52 inches, brown (10YR 4/3) heavy sandy loam; weak, fine, subangular blocky structure; friable when moist; calcareous; moderately alkaline; abrupt, smooth boundary.

C3—52 to 70 inches, light-gray (10YR 7/2) and pale-brown (10YR 6/3) sand; loose; calcareous; moderately alkaline.

The solum ranges from 18 to 35 inches in thickness and is variable within short distances. The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3) in color and from 6 to 12 inches in thickness. The B horizon is brown (10YR 4/3), yellowish brown (10YR 5/4), or pale brown (10YR 6/3) sandy loam or fine sandy loam. The C horizon is sand, sandy loam, or fine sandy loam. In places there is a buried soil below a depth of 24 inches. In some areas there are lenses of loose gravel. In some areas there are snail shells throughout the profile.

The Genesee soil, sandy variant, is on a similar landscape to that occupied by Genesee soils, Ross soils, and Ross soil, moderately deep variant. The Genesee soil, sandy variant, differs from the regular Genesee soils in being coarser textured throughout. It is lighter colored and coarser textured than the Ross soils. It is lighter colored and sandier throughout than the Ross soil, moderately deep variant. The well drained Genesee soil, sandy variant, is closely associated on the landscape with the well drained Genesee, moderately well drained Eel, and somewhat poorly drained Shoals soils.

Genesee sandy loam, sandy variant (0 to 2 percent slopes) (Gn).—This nearly level soil is on narrow, elongated

natural levees along the major streams, mainly near the bends in the channel and on some wider areas. This soil is commonly in small areas intermixed with other alluvial soils.

Included in mapping, on the flood plains northeast of Flat Rock, are soils that have a dark-colored surface layer.

This soil is droughty during long dry seasons. Flooding is the main hazard, and droughtiness is the main limitation to the use and management of this soil. Runoff is slow or very slow.

This soil is suited to corn and soybeans. Wheat and other winter grains are subject to damage by flooding. Grasses that are both water tolerant and somewhat drought resistant are suitable. Unless irrigation is used to supplement available moisture, this soil is not so well suited to crops as other well-drained alluvial soils in the county. (Capability unit IIs–6)

Gravel Pits

Gravel pits (Gp) are in areas of Fox, Nineveh, Ockley, Westland, Sleeth, and other soils that are underlain by loose sand and gravel. Most of these pits are on nearly level outwash terraces, but a few in Jackson Township are on high ridges that are underlain by gravel.

Most of the pits are excellent sources of gravel. The quality of gravel from the pits on the high ridges is generally not so good as that from the level outwash plains. Some of the pits that have been permanently filled with water are used as recreational areas. (Capability unit VIIIs–2)

Hennepin Series

The Hennepin series consists of deep, well-drained soils that formed in calcareous, moderately alkaline loam glacial till on uplands. These soils are steep and very steep and occur on breaks and side slopes of drainageways. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 4 inches of dark-brown loam. The subsoil is about 6 inches of calcareous, moderately alkaline, friable, dark-brown loam. The underlying material is at a depth of about 10 inches and consists of calcareous, moderately alkaline, brown loam till.

Hennepin soils have moderate permeability and a moderate available moisture capacity. These soils are naturally neutral to mildly alkaline and have low organic-matter content.

Hennepin soils are in cutover hardwood forests and small areas of permanent pasture. The dominant species of hardwoods are oaks, hard maple, hickory, and tulip-poplar.

Representative profile of Hennepin loam, 25 to 50 percent slopes, in a wooded area 250 feet south and 580 feet west of the northeast corner of SW¼ sec. 4, T. 13 N., R. 8 E.

A1—0 to 4 inches, dark-brown (10YR 4/3) loam; moderate, medium, granular structure; friable when moist; many roots; common till pebbles; few very dark grayish-brown (10YR 3/2) worm casts; calcareous; mildly alkaline; abrupt, smooth boundary.

B—4 to 10 inches, dark-brown (10YR 4/3) loam; moderate, fine, subangular blocky structure; friable when moist; few dark-brown (10YR 3/3) worm casts; common till pebbles; calcareous; moderately alkaline; clear, smooth boundary.

C—10 to 26 inches, brown (10YR 5/3) loam till; massive; friable when moist; common till pebbles; roots extending into weathering cracks; calcareous; moderately alkaline.

The solum ranges from 10 to 20 inches in thickness, but it is mainly 10 to 15 inches thick. The A horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). The B horizon is loam or light clay loam 4 to 12 inches thick. The B horizon is dark brown (10YR 4/3), dark yellowish brown (10YR 4/4), or brown (10YR 5/3). The C horizon is mainly loam but ranges from sandy loam to clay loam.

The Hennepin, Rodman, and Corydon soils are on similar terrain. Hennepin soils have a finer textured profile than Rodman soils, which formed in stratified gravel and sand. They have a deeper rooting zone than Corydon soils, which are stony throughout and are underlain by limestone bedrock at a depth of 10 to 20 inches. The well-drained Hennepin soils are closely associated on the landscape with the well-drained Miami soils and the somewhat poorly drained Crosby soils. The Hennepin soils are steeper than the Miami and Crosby soils.

Hennepin loam, 18 to 25 percent slopes (HeE).—This steep soil is on short breaks and hillsides along drainageways.

Included in mapping are small areas of deeper well-drained soils at the summit of the slopes and on small narrow ridges. A few, small, shallow gullies are included in some areas that are used for pasture.

This soil has very rapid runoff and is highly susceptible to erosion if the vegetation is removed. This soil is not suited to crops. If properly managed, it is suited to permanent pasture. It is suited to woodland and, with proper management, will produce moderate to rapid growth of such hardwoods as tulip-poplar. (Capability unit VIIe–2)

Hennepin loam, 25 to 50 percent slopes (HeF).—This very steep soil is on short breaks and hillsides along some of the major drainageways. This soil has the profile described as representative for the series.

Included in mapping are some areas of deeper well-drained soils at the summit of slopes and on intersecting small narrow ridges. A few small gullies are included in areas of this soil that are used for pasture.

This soil has very rapid runoff and is highly susceptible to erosion if the vegetation is removed. It is suited to woodland and, with proper management, produces moderate to rapid growth of such hardwood trees as tulip-poplar. (Capability unit VIIe–2)

Kokomo Series

The Kokomo series consists of deep, very poorly drained soils. These soils are in low depressions on uplands and terraces. The native vegetation was water-tolerant grasses, shrubs, and hardwoods.

In a representative profile, the surface layer is about 22 inches of silty clay loam. The upper part is very dark gray, and the lower part is black. The subsoil is about 20 inches of firm silty clay that is dark gray in the upper 14 inches and gray in the lower 6 inches. The subsoil has dark yellowish-brown, yellowish-brown, olive-brown, and brownish-yellow mottles. The underlying material is at a depth of about 42 inches and consists of calcareous, moderately alkaline, gray stratified gravelly clay loam, sandy clay loam, or gravelly clay. Loose calcareous gravel and sand occur at a depth of 72 inches.

These slowly permeable soils have a high available moisture capacity. They are naturally high in organic-matter content. Because the surface layer is naturally slightly acid to neutral, lime is not normally needed. The seasonal high water table is near the surface. There is ponding of surface water. These soils are mainly used for crops, but some areas are used for pasture and woodland.

Represenative profile of Kokomo silty clay loam, in a cultivated field 1,650 feet west and 240 feet north of the southeast corner of sec. 21, T. 14 N., R. 7 E.

Ap—0 to 6 inches, very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) when dry; moderate, fine, granular structure; firm when moist; few pebbles on the surface; several worm casts and wormholes; neutral; abrupt, smooth boundary.

A12—6 to 13 inches, black (10YR 2/1) silty clay loam; few, fine, dark yellowish-brown (10YR 4/4) mottles; weak, coarse, prismatic structure breaking to moderate, fine, subangular blocky; firm when moist; black (10YR 2/1) shiny organic films on faces of peds and on pebbles; few ½- to ¾-inch pebbles; neutral; clear, smooth boundary.

A13—13 to 22 inches, black (10YR 2/1) heavy silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6), grayish-brown (10YR 5/2), and olive-brown (2.5Y 4/4) mottles; weak, coarse, prismatic structure breaking to weak, coarse, subangular and angular blocky; firm when moist; black (10YR 2/1) shiny organic films on faces of peds; black (10YR 2/1) decomposing roots and twigs; neutral; gradual, wavy boundary.

B22tg—22 to 36 inches, dark-gray (N 4/0) light silty clay; common, fine, distinct, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles and some brownish-yellow (10YR 6/8) mottles; weak, coarse, subangular blocky structure; firm when moist; dark-gray (10YR 4/1) clay films on faces of peds; krotovinas filled with black (10YR 2/1) silty clay loam material; neutral; clear, wavy boundary.

B3g—36 to 42 inches, gray (N 5/0) silty clay; common, fine, distinct, olive-brown (2.5Y 4/4) mottles and some brownish-yellow (10YR 6/8) mottles; weak, coarse, subangular blocky structure; firm; discontinuous dark-gray (10YR 4/1) clay films or crack fills; very dark gray (10YR 3/1) silty clay loam fills in krotovinas; mildly alkaline; clear, wavy boundary.

C1g—42 to 72 inches, gray (N 5/0) and olive-brown (2.5Y 4/4) stratified gravelly clay, sandy clay loam, and gravelly clay loam; few stones 3 to 5 inches in diameter; many decomposing limestone pebbles; calcareous; moderately alkaline; gradual, wavy boundary.

C2—72 inches +, loose, moderately alkaline, calcareous gravel and sand.

The solum ranges from 36 to 60 inches in thickness but is mainly 38 to 48 inches thick. The A horizon is black (10YR 2/1), very dark gray (10YR 3/1), or very dark brown (10YR 2/2) and ranges from 14 to 23 inches in thickness. The A12 horizon generally contains enough sand to give it a gritty feel. The B2 horizon ranges from heavy silty clay loam to clay in texture and from dark gray (N 4/0) or gray (N 5/0) to olive gray (5Y 5/2) in color. The C horizon is loam till or stratified gravelly clay loam, sandy clay loam, gravelly clay, silty clay, or clay.

The Kokomo soils are closely associated with the Brookston and Westland soils and on similar terrain. The Kokomo soils have a thicker dark-colored surface layer and a finer textured subsoil than the Brookston or Westland soils.

Kokomo silty clay loam (0 to 2 percent slopes) (Ko).—This very poorly drained soil is in low depressions on terraces and uplands. On the low terrace areas this soil is underlain by stratified gravelly clay loam, sandy clay loam, and gravelly clay, and in most places there is loose gravel and sand at a depth of more than 42 inches. In some terrace areas near Norristown it is underlain by stratified silty clay, clay, and silt and limestone bedrock is at a depth of 42 inches or more. On the uplands it is underlain by loam till. The soil areas range from 3 to 25 acres in size.

Included in mapping are small areas of Brookston, Westland, and Sebewa soils. In places included soils have shells in the profile and are moderately alkaline throughout. Also included are some soils that have a clay loam surface layer and a few small areas of soils that have a thin layer of muck on the surface.

Wetness is the main limitation to farming. Runoff is very slow, and the water table is near the surface most of the year. In undrained areas water ponds on the surface during wet weather. A few low areas are subject to flooding. In places it is difficult to get an adequate outlet for a drainage system. Most undrained areas are used for pasture or water-tolerant trees. If adequately drained and managed, this soil is suited to crops. Corn and soybeans are the main row crops. If worked too wet, this soil is subject to puddling and becomes hard and cloddy upon drying. (Capability unit IIw–1)

Linwood Series

The Linwood series consists of deep, very poorly drained soils that have a muck surface layer 12 to 42 inches thick. These soils are in depressions near the base of slopes that are gravelly or have a stratum of water-bearing gravel that keeps the lower area saturated with water. The constant saturation favors the growth of organic matter but restricts its decomposition. The native vegetation was water-tolerant hardwood trees, sedges, and grasses.

In a representative profile, the muck layer is about 30 inches thick and has granular structure. It has two main parts. The upper 22 inches is black muck, and the lower 8 inches is black muck mottled with dark yellowish-brown. There is some decomposing, fibrous material below a depth of 22 inches. The underlying material is at a depth of about 30 inches and consists of gray, moderately alkaline, calcareous sandy clay loam.

Linwood soils are very high in organic-matter content and have a high available moisture capacity. They are naturally low in available phosphate and potash. Permeability is rapid in the muck and slow in the underlying material. Wetness is the main limitation to farming.

Some areas are drained and are used for crops. Undrained areas are in water-tolerant trees, bushes, and sedges.

Representative profile of Linwood muck, in a cultivated field, 1,026 feet south and 200 feet west of the northeast corner of NE¼ sec. 24, T. 13 N., R. 5 E.

Oa1—0 to 8 inches, black (10YR 2/1) muck; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

Oa2—8 to 22 inches, black (10YR 2/1) muck; moderate, coarse, granular structure; friable when moist; neutral; gradual, wavy boundary.

Oa3—22 to 30 inches, black (10YR 2/1) muck; some dark yellowish-brown (10YR 3/4) mottles; moderate, coarse, granular structure; friable when moist; few, decaying, fibrous roots; neutral; clear, smooth boundary.

IIC—30 to 53 inches, gray (N 5/0), moderately alkaline, calcareous sandy clay loam.

The muck ranges from 12 to 42 inches in thickness. In places there are layers of decomposing wood and leaves.

Some of the lower horizons of muck have strong-brown (7.5YR 5/0) and reddish-brown (5YR 5/4) streaks or mottles, and in places there is black gelatinous material. The underlying material is loam, clay loam, or sandy clay loam.

Linwood soils are associated with Westland, Kokomo, and Saranac soils and occupy similar positions on the landscape. Linwood soils have a muck surface layer more than 12 inches thick that is lacking in the Westland, Kokomo, and Saranac soils.

Linwood muck (0 to 2 percent slopes) (Lm).—This soil is in depressions near the base of steeper slopes or old cutoff stream meanders. The areas of this soil range in size from 3 to 20 acres.

Included in mapping are small areas of soils that have less than 12 inches of muck over silty clay loam mineral material. Included in the deeper parts of some of the depressions are soils that have a surface layer of muck 42 inches or more thick. Small areas of Westland, Kokomo, and Saranac soils are also included in mapping.

The water table is near the surface. Runoff is very slow or is ponded, and some areas of this soil are flooded. Wetness is a limitation to use of this soil. If this soil is drained, there is a hazard of soil blowing. If drained, this soil decomposes rapidly and releases nitrogen for plant use. If this soil is adequately drained and fertilized and is managed properly, it is suited to corn and soybeans or other annual row crops. It is suited to specialty crops such as sweet corn, onions, carrots, and other vegetables. (Capability unit IIw–10)

Martinsville Series

The Martinsville series consists of deep, well-drained soils. These soils formed in a thin layer of loamy or silty material underlain by sand and silt. The depth to the calcareous sand and silt is 42 to 60 inches. These soils are nearly level to gently sloping and are on outwash terraces along the major streams. The native vegetation was hardwoods.

In a representative profile, the surface layer is about 6 inches of dark grayish-brown loam. The subsurface layer is about 4 inches of friable, dark-brown loam. The dark-brown subsoil, about 37 inches thick, is friable loam in the upper 5 inches, firm clay loam to a depth of 43 inches, and firm sandy clay loam in the lower 4 inches. The underlying material, at a depth of about 47 inches, consists of grayish-brown and brown, stratified sand and silt that contains thin lenses of fine gravel.

Martinsville soils have moderate permeability and a high available moisture capacity. The surface layer is medium acid unless it has been limed. These soils have moderate to low organic-matter content. Most areas are used for crops.

Representative profile of Martinsville loam, 0 to 2 percent slopes, in a cultivated field 90 feet north and 50 feet east of the southwest corner of the SE¼ sec. 11, T. 12 N., R. 5 E.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) loam, light brownish gray (10YR 6/2) when dry; moderate, fine, granular structure; friable when moist; few dark-brown (10YR 3/3) worm casts; neutral; abrupt, smooth boundary.

A2—6 to 10 inches, dark-brown (10YR 4/3) loam; weak, thick, platy structure breaking to moderate, fine, granular; friable when moist; few fine voids less than 1 millimeter in diameter; few 2- to 3-millimeter wormholes; dark-brown (10YR 3/3) worm casts; neutral; clear, smooth boundary.

B1—10 to 15 inches, dark-brown (7.5YR 4/4) loam; weak, medium, subangular blocky structure; friable when moist; few, discontinuous, dark-brown (10YR 3/3) clay films on faces of peds; few 2- to 4-millimeter wormholes; few, small pebbles 2 to 5 millimeters in diameter; dark-brown (10YR 3/3) worm casts; neutral; clear, smooth boundary.

B21t—15 to 26 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films continuous on faces of peds; medium acid; clear, smooth boundary.

B22t—26 to 43 inches, dark-brown (7.5YR 4/4) clay loam; moderate and strong, medium, subangular and angular blocky structure; firm when moist; dark-brown (7.5YR 4/2) clay films continuous on faces of peds; few root holes and wormholes; medium acid in upper part and neutral in lower part; clear, wavy boundary.

B3t—43 to 47 inches, dark-brown (7.5YR 3/2) sandy clay loam; weak, coarse, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films on faces of most peds; neutral; clear, wavy boundary.

C—47 to 66 inches, grayish-brown (10YR 5/2) and brown (10YR 5/3), stratified fine sand, silt, and some fine gravel; calcareous; moderately alkaline.

The solum ranges from 42 to 60 inches thick. The Ap horizon is dark grayish brown (10YR 4/2), brown (10YR 5/3), or dark brown (10YR 4/3). The A2 horizon is lacking in some areas. The B2 horizon ranges from dark reddish brown (5YR 3/4) or dark brown (7.5YR 4/4) through dark yellowish brown (10YR 4/4). It is mainly clay loam but ranges from sandy clay to silty clay loam. The B3 horizon ranges from 1 to 6 inches in thickness, from reddish brown (5YR 5/3) to dark brown (7.5YR 3/2) in color, and from sandy clay loam to loam in texture.

Martinsville, Ockley, and Fox soils occupy similar positions on the landscape. Martinsville soils have fewer pebbles throughout the profile than Ockley soils, which formed over stratified gravel and sand. They have fewer pebbles and a thicker solum than Fox soils, which are underlain by loose gravel and sand at a depth of 24 to 42 inches. They have a thicker solum than Miami soils, which formed in loam till. The well-drained Martinsville soils are closely associated on the landscape with the nearly level, somewhat poorly drained Whitaker soils and the depressional, very poorly drained Rensselaer soils.

Martinsville loam, 0 to 2 percent slopes (MaA).—This nearly level, well-drained soil is on terraces along the major streams. This soil has the profile described as representative for the series. Areas range in size from 5 to more than 100 acres. Where this soil adjoins Fox soils, there is fine gravel in the lower part of the subsoil and in the underlying material. In areas where it adjoins Nineveh soils, it has a very dark grayish-brown surface layer and a slightly acid subsoil that contains gravel.

Included in mapping are small areas of this soil that have a silt loam surface layer. Small areas that are mottled at a depth of 18 to 30 inches are also included. Near Flat Rock there are included some soils that have a fine sandy loam surface layer. A few, small, gently sloping soils are also included.

Runoff is slow. A few small areas of this soil are on low terraces and are flooded when there is an extremely high water table. This soil is suited to all crops commonly grown in the county. It is well suited to irrigation (fig. 10). (Capability unit I–1)

Martinsville loam, 2 to 6 percent slopes, eroded (MaB2).—This gently sloping, eroded soil has short slopes and is on narrow, elongated ridges on stream terraces.

Figure 10.—Irrigation supplements the moisture for a crop of green beans on Martinsville loam, 0 to 2 percent slopes.

Areas of this soil range from 2 to 10 acres in size and are commonly intermixed with areas of Martinsville loam, 0 to 2 percent slopes.

This soil has a profile similar to that described as representative for the series, except that in places part of the original surface layer has been removed by erosion. The present plow layer consists of a mixture of material from the original surface layer and a moderate amount of material from the dark-brown clay loam subsoil. The depth to the underlying material is mainly 42 to 50 inches.

Included in mapping are some soils that have a gritty silt loam and fine sandy loam surface layer. The clay loam subsoil is exposed in some small, severely eroded areas that are included in mapping.

Runoff is slow, and there is a moderate erosion hazard. If erosion is controlled and proper management is used, this soil is suited to all crops common in the county. (Capability unit IIe-1)

Medway Series

The Medway series consists of deep, moderately well drained soils on flood plains of some of the major streams. These soils formed in neutral or moderately alkaline alluvial material. The native vegetation was mixed hardwoods and grasses.

In a representative profile, the surface layer is about 18 inches of very dark grayish-brown silt loam. The subsoil, about 18 inches thick, is dark grayish-brown, friable loam that has strong-brown and grayish-brown mottles in the upper 5 inches and is grayish-brown, friable loam mottled with strong brown in the lower 13 inches. The underlying material is at a depth of about 36 inches and consists of grayish-brown, stratified loam and sandy loam streaked with yellowish red.

Medway soils have a high available moisture capacity and moderate permeability. They are naturally high in organic-matter content and are neutral. These soils are subject to flooding during winter and early in spring. They are mainly used for crops, but small areas are in permanent pasture.

Representative profile of Medway silt loam, in a cultivated field 20 feet straight north of the southeast corner of the SW¼ sec. 26, T. 14 N., R. 5 E.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) rubbed silt loam; weak, fine, granular structure; friable when moist; few wormholes and worm casts; neutral; abrupt, smooth boundary.

A12—8 to 18 inches, very dark grayish-brown (10YR 3/2) rubbed silt loam; weak, medium, subangular blocky structure; friable when moist; few wormholes and worm casts; neutral; clear, smooth boundary.

B21—18 to 23 inches, very dark grayish-brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) when crushed; common, medium, distinct, strong-brown (7.5YR 5/6) and grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; friable when moist; several very dark grayish-brown (10YR 3/2) worm casts; common voids up to 4 millimeters in diameter; common roots; neutral; clear, smooth boundary.

B22—23 to 36 inches, grayish-brown (10YR 5/2) loam; common, medium, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; massive; friable when moist; calcareous; mildly alkaline; gradual, smooth boundary.

C—36 to 50 inches, grayish-brown (10YR 5/2) loam and sandy loam with streaks of yellowish red (5YR 4/8); massive; friable; calcareous; moderately alkaline.

The A horizon is very dark grayish brown or dark brown in color and ranges from 14 to 24 inches in thickness. It generally contains enough sand to feel gritty. The structure of the horizons is weak or moderate. The depth to mottles ranges from 16 to 30 inches. The depth to the underlying material ranges from 30 to 45 inches. The underlying material is loam, sandy loam, clay loam, or silt loam.

The Medway, Eel, and Ross soils formed in similar materials and on similar terrain. Medway soils have a darker colored surface layer than Eel soils. They have a thinner dark layer than Ross soils, which have no mottles above a depth of 30 inches. The moderately well drained Medway soils are closely associated on the landscape with the well drained Ross soils.

Medway silt loam (0 to 2 percent slopes) (Me).—This nearly level soil is on the flood plains of some of the major streams. The soil areas range in size from 4 to more than 40 acres.

Included in mapping are soils that have a loam and silty clay loam surface layer. A few small areas of Saranac soils are included in some of the old stream meanders. In places near the streams, small narrow areas of Ross soils are included.

Runoff is slow or very slow, and wetness is a moderate limitation. The principal hazard is flooding of short duration during winter and early in spring. This soil is suited to corn, soybeans, and other annual row crops. A few areas that are irregularly dissected by meandering stream channels are used for pasture. Fall-seeded small grains are likely to be damaged by flooding. In areas protected by levees or where flooding is only occasional, this soil is suited to all crops common in the county. (Capability unit I-2)

Miami Series

The Miami series consists of deep, well-drained soils. These soils formed in thin loess and glacial till. They are

on knolls, ridges, and breaks along drainageways on uplands throughout the county. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 6 inches of dark-brown silt loam. The subsoil, about 34 inches thick, has about 4 inches of dark yellowish-brown, friable silt loam in the upper part. The middle 25 inches is dark yellowish-brown and yellowish-brown, firm clay loam that overlies about 5 inches of dark-brown, firm clay loam. The underlying material, at a depth of about 40 inches, consists of brown and yellowish-brown, calcareous loam glacial till.

Miami soils have moderately slow permeability and a high available moisture capacity. The surface layer is medium acid unless it has been limed. These soils are naturally low in organic-matter content. Erosion is the main hazard if the soil is sloping. Most areas are cultivated, but a few areas are in permanent pasture or trees.

Representative profile of Miami silt loam, 2 to 6 percent slopes, eroded, in a cultivated field 660 feet east and 1,148 feet south of the northwest corner of sec. 15, T. 13 N., R. 7 E.

Ap—0 to 6 inches, dark-brown (10YR 4/3) silt loam, pale brown (10YR 6/3) when dry; weak, medium, granular structure; friable when moist; several roots; common fine voids less than 1 millimeter in diameter; few worm casts; few small pieces of dark yellowish-brown (10YR 4/4) material; medium acid, abrupt, smooth boundary.

B1—6 to 10 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; moderate, medium, subangular blocky structure; firm when moist; patches of dark-brown (7.5YR 3/3) clay films on faces of peds; few worm casts and wormholes; few voids; medium acid; clear, smooth boundary.

B21t—10 to 29 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/3) clay films continuous on faces of peds and on pebbles; few roots in cracks; few 1- to 5-millimeter voids in the interior of peds; strongly acid; clear, smooth boundary.

B22t—29 to 35 inches, yellowish-brown (10YR 5/4) clay loam; moderate, medium and some coarse, subangular blocky structure; firm when moist; dark-brown (10YR 4/3) clay films continuous on faces of peds and on pebbles; few small voids less than 1 millimeter in diameter in ped interiors; few black concretions; medium acid; abrupt, wavy boundary.

B3t—35 to 40 inches, dark-brown (7.5YR 3/2) clay loam; weak, coarse, subangular blocky structure; firm when moist; few fine voids coated with dark-brown (7.5YR 3/2) clay films; clay films on faces of peds and on pebbles; neutral; abrupt, wavy boundary.

C—40 to 70 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/4) till; few streaks of dark-brown (7.5YR 3/2) clay films extend into cracks; calcareous; moderately alkaline.

The solum ranges from 24 to 42 inches in thickness. The Ap horizon is brown (10YR 5/3), dark brown (10YR 4/3), or dark yellowish brown (10YR 4/4). In wooded areas the A1 horizon is dark grayish brown (10YR 4/2) or very dark grayish brown (10YR 3/2). An A2 horizon of brown (10YR 5/3) or yellowish-brown (10YR 5/4) silt loam 2 to 6 inches thick is in some areas. The Ap and B1 horizons generally contain enough sand to feel gritty. The B1 horizon is loam or silt loam 1 to 6 inches thick. The B2 horizon is clay loam or silty clay loam that ranges from dark brown (7.5YR 3/2) to yellowish brown (10YR 5/4) in color.

Miami, Princeton, and Parke soils are on similar locations. The Miami soils have a thinner solum and have less sand throughout the profile than Princeton soils. They are less acid and have a thinner solum than Parke soils. The well-drained Miami soils are closely associated on the landscape with the very poorly drained Brookston soils in depressions, the somewhat poorly drained, nearly level Crosby soils, and the shallow, well-drained Hennepin soils, which are steeper.

Miami silt loam, 2 to 6 percent slopes, eroded (MlB2).—This gently sloping, eroded soil is on low knolls, ridgetops, and breaks adjacent to drainageways. This soil is on uplands throughout the county and ranges in size from 3 to more than 40 acres. This soil has the profile described as representative for the series. In wooded areas the upper 2 to 3 inches of the surface layer is dark grayish brown.

Small areas of somewhat poorly drained and poorly drained soils are included on the lower slopes and in some drainageways. A few severely eroded soils are also included. Included near Pleasant View are soils that have a finer textured subsoil and a somewhat thinner solum. Soils in this area dry out slower following rains than similar soils in other parts of the county, thus delaying fieldwork. On the high ridges in Jackson Township this soil is underlain by gravel and sand at a depth of 8 to 15 feet. In this area part of this soil has a reddish-brown subsoil, and in places the subsoil is very strongly acid. Also included are small areas of Parke soils. If ponds are built in this area, they are subject to leaking.

Runoff is slow to medium. Erosion is the main hazard if this soil is cultivated. This soil is suited to all crops common in the county if it is managed properly and if erosion is controlled. (Capability unit IIe–1)

Miami silt loam, 6 to 12 percent slopes, eroded (MlC2).—This sloping, eroded soil is adjacent to drainageways, on knolls, and on narrow, elongated ridges between steeper drainageways. Soil areas are irregularly shaped and range in size from 2 to 10 acres. This soil has a profile similar to that described as representative for the series, except that it is somewhat thinner. Depth to the underlying limy till is 24 to 30 inches.

Some soils near the center of the slopes have calcareous till at a depth of less than 24 inches. Also included in mapping are severely eroded soils. On the lower part of some slopes and in some drainageways, are some small areas of somewhat poorly drained and poorly drained soils. Included near Pleasant View are soils with a fine-textured subsoil. Soils in this area dry out slower than similar soils in other parts of the county, thus delaying fieldwork. On the high ridges in Jackson Township sand and gravel are at a depth of 6 to 15 feet. In this area part of the soil has a reddish-brown subsoil, and in some places the subsoil is very strongly acid. Also included are a few small areas of Parke soils. If ponds are built in this area, they are subject to leaking.

Runoff is medium. Erosion is the main hazard in the use and management of this soil. This soil is suited to all crops common in the county, provided it is properly managed and erosion is controlled. It is suited to permanent pasture or woodland. (Capability unit IIIe–1)

Miami silt loam, 12 to 18 percent slopes, eroded (MlD2).—This moderately steep, eroded soil is on breaks along the major drainageways and on hillsides. This soil has a profile similar to that described as representative for the series, except that it has a somewhat thinner solum. Depth to the underlying till is mainly 24 to 30 inches. The upper 2 or 3 inches of the surface layer is dark colored in wooded areas.

Included in mapping are small areas of moderately steep soils and soils that are severely eroded. Some areas of soils included near the center of the slope have calcareous till at a depth of less than 24 inches. On the high ridges in Jackson Township are areas that have sand and gravel at a depth of 6 to 15 feet. On these ridges part of the subsoil is reddish brown, and in places the subsoil is very strongly acid. Also included are a few small areas of Negley soils. Ponds are subject to leaking if built in this area.

Runoff is rapid. Erosion is the main hazard in use and management of this soil. This soil is suited to small grains, meadow, and pasture if it is properly managed and if erosion is controlled. It is also suited to trees. (Capability unit IVe-1)

Miami clay loam, 2 to 6 percent slopes, severely eroded (MmB3).—This gently sloping, severely eroded soil is on low knolls, ridgetops, and breaks along small drainageways. Soil areas are irregularly shaped and are generally less than 5 acres in size.

This soil has a profile similar to that described as representative for the series, except that erosion has removed most of the original surface soil and the profile is 5 to 8 inches thinner. The present plow layer consists mainly of the yellowish-brown or brown clay loam subsoil. In places there are a few shallow gullies.

Included in mapping are soils in which the underlying till is at a depth of less than 24 inches. Included also are small areas of soils that have slopes of 6 to 12 percent. Small areas of somewhat poorly drained and poorly drained soils are included on the lower part of some slopes and in drainageways. Included near Pleasant View are soils that have a fine-textured subsoil. Soils in this area dry slower than similar soils in other parts of the county, thus delaying fieldwork. On the high ridges of Jackson Township this soil is underlain by sand and gravel at a depth of 8 to 15 feet. Part of this soil has a reddish-brown subsoil, and in places the subsoil is very strongly acid. Also included in Jackson Township are small areas of Parke soils. If ponds are built in this area, they are subject to leaking.

Runoff is medium. Erosion is the main hazard in use and management of this soil. This soil is suited to all crops common in the county if managed properly and if erosion is controlled. If worked when wet, this soil becomes hard and cloddy upon drying. (Capability unit IIIe-1)

Miami clay loam, 6 to 12 percent slopes, severely eroded (MmC3).—This sloping, severely eroded soil occupies knolls and breaks along drainageways. Soil areas are irregularly shaped and range in size from 3 to 30 acres.

This soil has a profile similar to that described as representative for the series, except that erosion has removed most of the original surface layer. The present plow layer consists of material from the yellowish-brown or brown subsoil mixed with a small amount of the original surface layer. The depth to calcareous till is mainly 24 to 30 inches. In places there are a few shallow gullies.

Included in mapping are soils underlain by calcareous till at a depth of 10 to 24 inches. In places the limy till is exposed at the surface. Also included are small areas of moderately steep soils. On the lower part of some slopes and in drainageways are small areas of somewhat poorly drained and poorly drained soils. Near Pleasant View some soils that have a fine-textured subsoil are included. Soils in this area dry slower than similar soils in other parts of the county, thus delaying fieldwork. On the high ridges in Jackson Township the soil is underlain by sand and gravel at a depth of 5 to 15 feet. In this area part of the subsoil is reddish brown, and in some places it is very strongly acid. Also included in this area are small areas of Parke soils. Ponds built in this area are subject to leaking.

The water intake rate is slower than in the less sloping Miami soils. Runoff is medium or rapid. Erosion is the main hazard in use and management of this soil. If properly managed and if erosion is controlled, this soil is suited to small grains, hay, and pasture. It is also suited to an occasional row crop if erosion is controlled. If this soil is plowed when too wet, large clods, which become very hard when dry, are likely to form. This condition greatly hinders preparation of a good seedbed. (Capability unit IVe-1)

Miami clay loam, 12 to 18 percent slopes, severely eroded (MmD3).—This severely eroded, moderately steep soil is on breaks along the major drainageways and on hillsides. This soil has a profile similar to that described as representative for the series, except that it has a somewhat thinner solum and erosion has removed most of the original surface layer. The present plow layer consists mainly of yellowish-brown or brown subsoil. In places there are a few gullies.

Some areas of soil near the center of the slopes have calcareous till at a depth of less than 24 inches. In some small areas, limy till is exposed on the surface. Also included in mapping are small areas of steep Hennepin soils. In some drainageways there are included small areas of alluvial soils. On the high ridges in Jackson Township this soil is underlain by sand and gravel at a depth of 4 to 10 feet. In this area part of this soil has a reddish-brown subsoil, and in places the subsoil is very strongly acid. Also included are small areas of Negley soils. Ponds are subject to leaking if built in this area.

Runoff is rapid. If cultivated, this soil is subject to severe erosion. This soil is suited to hay or pasture if managed properly and if erosion is controlled. This soil is difficult to plow and becomes cloddy when dry. (Capability unit VIe-1)

Miami-Crosby silt loams, 0 to 6 percent slopes (MrB).—This complex consists of well-drained and somewhat poorly drained soils that formed in glacial till on uplands. This complex is mainly in the hummocky areas. It consists of about 60 percent Miami soils, 25 percent Crosby soils, and 15 percent other soils that are too small to map separately. Miami silt loam is on the higher knolls and ridges. The Crosby soils are on the low knolls and ridges and on some of the nearly level areas between them.

The Miami part of this complex has a profile similar to that described as representative for the Miami series. The Crosby part of the complex has a profile similar to that described as representative for the Crosby series, except that in places part of the original surface layer has been removed by erosion. In some small areas the subsoil is exposed at the surface. In some of the low areas and pockets 6 to 12 inches of silty material has been deposited on the surface.

Included in mapping are small areas of Brookston and Shoals soils in low swales and in pockets between ridges

and knolls. On a few small knolls soils that slope more than 6 percent are also included.

There is an erosion hazard on the knolls and ridges. Wetness limits use of the soils on low knolls and ridges and the low areas in between them. Water ponds in some of the low pockets. If these soils are adequately drained and properly managed and if erosion is controlled, these soils are suited to all crops common in the county. A drainage system is needed to help remove excess water from the wet areas. In places it is difficult to establish an adequate outlet. These soils are suited to trees. (Capability unit IIe-1)

Millsdale Series

The Millsdale series consists of moderately deep, very poorly drained soils that formed in a thin layer of glacial drift underlain by limestone bedrock at a depth of 24 to 42 inches. These soils occupy depressions and small areas at the base of some slopes. The native vegetation was water-tolerant grasses, shrubs, and hardwoods.

In a representative profile, the surface layer is about 15 inches of silty clay loam. The upper 8 inches is very dark gray, and the lower part is very dark brown. The subsoil is about 19 inches of heavy silty clay loam. The upper part, about 13 inches thick, is grayish brown and contains light olive-brown mottles. The lower part is gray and contains yellowish-brown and light olive-brown mottles. The underlying material is limestone bedrock and is at a depth of about 34 inches.

These soils have a moderate to high available moisture capacity. They are naturally high in organic-matter content. Permeability is moderately slow. The surface layer is naturally slightly acid or neutral, and additional lime is not likely to be needed. The seasonal high water table is near the surface. Water ponds on the surface during wet seasons. The main limitation to use and management is excessive wetness.

Millsdale soils are used mainly for crops.

Representative profile of Millsdale silty clay loam, in a cultivated field 80 feet west and 740 feet south of the northeast corner of NW¼ sec. 33, T. 11 N., R. 8 E.

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay loam; weak, fine, granular structure; firm when moist; neutral; abrupt, smooth boundary.

A12—8 to 15 inches, very dark brown (10YR 2/2) silty clay loam; moderate, fine, subangular blocky structure; firm when moist; shiny films on faces of peds; neutral; clear, smooth boundary.

B21tg—15 to 28 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam; common, medium, distinct, light olive-brown (2.5Y 5/6) mottles; weak, medium, prismatic structure breaking to moderate, medium, subangular blocky; firm when moist; gray (10YR 5/1) continuous clay films on faces of peds; few pebbles; neutral; clear, smooth boundary.

B22tg—28 to 34 inches, gray (10YR 5/1) heavy silty clay loam; common, medium, prominent, yellowish-brown (10YR 5/6) and light olive-brown (2.5Y 5/4) mottles; weak, medium and coarse, subangular blocky structure; firm when moist; grayish-brown (2.5Y 5/2) clay films on some faces of peds; common sand grains and a few pebbles; neutral to mildly alkaline; abrupt, wavy boundary.

R—34 inches +, limestone bedrock.

The solum is 24 to 42 inches thick, but it is mainly 32 to 40 inches thick. The Ap horizon is very dark gray (10YR 3/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). The A horizon ranges from 12 to 20 inches in thickness but is mainly 12 to 16 inches thick. In some areas there is a grayish-brown (10YR 5/2 or 2.5Y 5/2) or dark grayish-brown (10YR 4/2) B1 horizon mottled with yellowish brown (10YR 5/4 and 5/6). The B2 horizon is gray (10YR 5/1 and N 5/0) or grayish brown (10YR 5/2 and 2.5Y 5/2). It ranges from heavy silty clay loam to clay in texture.

Millsdale, Brookston, and Westland soils are on similar terrain. Millsdale soils have a finer textured subsoil than Brookston soils, which formed in loam till, or Westland soils, which are underlain by stratified sand and gravel. The very poorly drained Millsdale soils are closely associated on the landscape with the somewhat poorly drained Randolph and the well-drained Milton soils.

Millsdale silty clay loam (0 to 2 percent slopes) (Ms).—This soil is in elongated, narrow depressions and other small depressions and is underlain by limestone.

Included in mapping are some places that have a few inches of calcareous, moderately alkaline gravelly loam material between the subsoil and the bedrock. Some included places have boulders and limestone fragments just above the limestone. Included in mapping are soils that have a clay loam surface layer. Some small areas of included soils are 42 to 48 inches deep to the underlying limestone bedrock.

Wetness is the main limitation to use and management of this soil. Runoff is slow or very slow. In places it is difficult to get an adequate outlet for a drainage system. This soil, if worked when too wet, is subject to puddling and becomes hard and cloddy upon drying. This soil is suited to all crops in the county if it is properly managed and adequately drained. Corn and soybeans are the main crops. (Capability unit IIIw-5)

Milton Series

The Milton series consists of moderately deep, well-drained soils. These soils formed in a thin layer of glacial drift underlain by limestone bedrock at a depth of 24 to 42 inches. They are nearly level to gently sloping and are in the southern part of the county near the Flatrock River. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 8 inches of dark yellowish-brown silt loam. The subsoil is about 22 inches thick and is dark brown. The upper 15 inches is clay loam, and the lower 7 inches is gravelly clay loam. The underlying material is limestone bedrock at a depth of about 30 inches.

These soils have moderate permeability and a low to moderate available moisture capacity. They are naturally low in organic-matter content. The surface layer is medium acid or slightly acid unless it has been limed. These soils are somewhat droughty during long dry seasons.

Milton soils are used mainly for crops, but a few areas are in permanent pasture.

Representative profile of Milton silt loam, 1 to 6 percent slopes, in a cultivated field 820 feet east and 20 feet south of the northwest corner of the SW¼ sec. 22, T. 11 N., R. 7 E.

Ap—0 to 8 inches, dark yellowish-brown (10YR 3/4) silt loam; moderate, medium, granular structure; friable when moist; abundant roots; several 1- to 2-millimeter wormholes and worm casts; neutral; abrupt, smooth boundary.

B21t—8 to 17 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium, granular structure; friable when

moist; dark reddish-brown (5YR 3/4) clay films continuous on all faces of peds; a few glacial pebbles less than 1 inch in diameter; slightly acid; clear, wavy boundary.

B22t—17 to 23 inches, dark-brown (7.5YR 4/4) heavy clay loam; moderate, medium, subangular and angular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films continuous on all faces of peds; few small chert fragments; several pebbles; slightly acid; smooth, clear boundary.

B23t—23 to 30 inches, dark-brown (7.5YR 4/4) gravelly clay loam; weak, medium, subangular and angular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films continuous on faces of peds and on stones; common pebbles and fragments of decomposing limestone; moderately alkaline; calcareous; abrupt, irregular boundary.

C—30 inches +, limestone bedrock; tongues of material from the B23t horizon extend into the cracks; roots extend into the crack fills.

The solum ranges from 24 to 40 inches in thickness but is mainly 32 to 40 inches thick. Depth to bedrock is variable within short distances. The Ap horizon is dark brown (10YR 4/3 and 7.5YR 4/4) or dark yellowish brown (10YR 3/4 and 4/4). It generally contains enough sand to feel gritty. In some places there is a dark yellowish-brown (10YR 4/4) silt loam or silty clay loam B1 horizon. Texture of the B2 horizon is clay loam, gravelly clay loam, or clay. The B2 horizon is dark brown (7.5YR 4/4), reddish brown (5YR 5/4 and 4/4), or dark yellowish brown (10YR 4/4). The loess ranges from 0 to 18 inches in thickness.

Milton, Miami, Nineveh, and Fox soils occupy similar positions on the landscape. Milton soils have a finer textured subsoil and a thinner solum than Miami soils, which formed in loam till. They have a solum underlain by bedrock, whereas Fox and Nineveh soils have a solum underlain by loose gravel and sand. The well-drained Milton soils are closely associated on the landscape with the somewhat poorly drained Randolph soils and the very poorly drained Millsdale soils.

Milton silt loam, 1 to 6 percent slopes (MtB).—This nearly level to gently sloping soil is underlain by limestone bedrock at a depth of 24 to 42 inches. The soil areas are irregular and range in size from 3 to 10 acres. In a few places part of the original surface layer has been removed by erosion.

Included in mapping are small areas of soils in which limestone bedrock is at a depth of less than 24 inches. In places there are fragments of chert and limestone on the surface. Also included are some small areas of severely eroded soils.

Runoff is medium. Erosion is the main hazard in the use and management of this soil. This soil is somewhat droughty during dry weather. It is suited to all crops common in the county. Due to its droughtiness, this soil is particularly suited to a fall-seeded small grain, such as wheat. (Capability unit IIIe-8)

Negley Series

The Negley series consists of deep, well-drained soils. These soils formed in sandy and gravelly outwash material of Illinoian age. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 8 inches of dark yellowish-brown loam. The subsurface layer is yellowish-brown loam about 5 inches thick. The subsoil is about 38 inches thick. The upper 7 inches is dark-brown clay loam; the middle 10 inches is reddish-brown clay loam, and the lower part is reddish-brown and dark reddish-brown sandy clay loam. The underlying material is at a depth of about 50 inches and consists of dark-brown, stratified clay loam, sandy clay loam, and fine sand. At a depth of 12 feet or more the underlying material is loose, calcareous sand and fine gravel.

These soils are moderately permeable in the subsoil and moderately rapidly permeable in the underlying material. They have a high available moisture capacity and are naturally low in organic-matter content. The surface layer is medium acid or strongly acid unless it has been limed. Erosion is the main hazard if these soils are cultivated.

These soils are used for crops, trees, and pasture.

Representative profile of Negley loam, 12 to 18 percent slopes, eroded, in a pasture 825 feet east and 10 feet south of the northwest corner of sec. 29, T. 11 N., R. 6 E.

Ap—0 to 7 inches, dark yellowish-brown (10YR 3/4) loam; moderate, fine, granular structure; friable when moist; abundant roots; few very dark grayish-brown (10YR 3/2) worm casts; strongly acid; abrupt, smooth boundary.

A2—7 to 12 inches, yellowish-brown (10YR 5/4) loam; weak, thin, platy structure; friable when moist; many roots; strongly acid; abrupt, wavy boundary.

B21t—12 to 19 inches, dark-brown (7.5YR 4/4) light clay loam; moderate, fine, subangular blocky structure; firm when moist; dark-brown (7.5YR 4/4) clay films continuous on faces of peds; few roots; few rounded pebbles 2 to 7 millimeters in diameter; common very fine voids less than 1 millimeter in diameter; few 2- to 4-millimeter voids; very strongly acid; clear, smooth boundary.

B22t—19 to 29 inches, reddish-brown (5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm when moist; reddish-brown (5YR 4/3) clay films continuous on faces of peds; few, fine, fibrous roots; few rounded pebbles 2 to 10 millimeters in diameter; very strongly acid; clear, smooth boundary.

B23t—29 to 46 inches, reddish-brown (5YR 4/4) sandy clay loam; weak, coarse, subangular blocky structure; firm when moist; reddish-brown (5YR 4/3) clay films mainly on vertical faces of peds; few, small, black (10YR 2/1) manganese stains; very strongly acid; abrupt, irregular boundary.

B3—46 to 50 inches, dark reddish-brown (5YR 3/4) sandy clay loam; massive; firm when moist; very strongly acid; abrupt, irregular boundary.

C1—50 to 120 inches, dark-brown (7.5YR 4/4), stratified sandy clay loam, clay loam, and fine sand; many small pebbles in different strata; very strongly acid in upper part, neutral in lower part.

C2—120 inches +, stratified sand and fine gravel; moderately alkaline; calcareous.

The Ap horizon ranges from brown (10YR 5/3) to dark yellowish brown (10YR 4/4). In wooded areas there is a 1- to 5-inch, dark grayish-brown (10YR 4/2) or very dark grayish-brown (10YR 3/2) A1 horizon. In some places there is a 2- to 5-inch B1 horizon of reddish-brown (5YR 4/4) or dark-brown (7.5YR 4/4) loam. The B2 horizon ranges in color from reddish brown (5YR 4/4 and 5/4) through strong brown (7.5YR 5/6). The B2 horizon is clay loam, sandy clay loam, or gravelly clay loam. The B3 horizon ranges from 4 to 20 inches in thickness and is sandy clay loam, sandy loam, clay loam, or loam. Depth to loose calcareous gravel and sand ranges from 10 to 15 feet.

Negley soils are closely associated on the landscape with Parke soils and occupy similar terrain as Rodman soils. Negley soils are similar to Parke soils, but differ in having a loess mantle less than 18 inches thick over gravelly outwash that is calcareous at a depth of 12 to 15 feet. Negley soils are redder, thicker, more acid, and have more strongly developed soil horizons than Rodman soils, which are underlain by loose gravel and sand at a depth of less than 24 inches.

Negley loam, 12 to 18 percent slopes, eroded (NeD2).—This moderately steep, eroded soil is on hillsides and side slopes of drainageways. The soil areas are irregularly shaped and range in size from 5 to 20 acres. This soil has the profile described as representative for the series.

Included in mapping are some areas of severely eroded soils. A few small areas of Rodman, Hennepin, and Miami soils are included. On some ridgetops the surface layer is silt loam.

Runoff of surface water is moderate. Erosion is the main hazard. This soil is suited to small grains, hay, and pasture if managed properly and if erosion is controlled. It is suited to deep-rooted trees, such as black walnut. (Capability unit IVe–9)

Negley loam, 18 to 25 percent slopes (NeE).—This steep soil is on hillsides and on side slopes of drainageways. There are several old abandoned gravel pits in areas of this soil. In places there are large chunks of cemented gravel in the soil. A few areas are severely eroded and gullied.

Included in mapping are some soils that slope more than 25 percent. In the included steeper areas the depth to the loose calcareous sand and gravel is 6 to 10 feet. In places there are a few small areas of Rodman and Hennepin soils included.

Runoff is rapid. Erosion is the main hazard in the use and management of this soil. This soil is suited to permanent pasture and hay if it is properly managed and if erosion is controlled. It is suited to trees, and some areas have a good stand of black walnut and black cherry trees. (Capability unit VIe–1)

Nineveh Series

The Nineveh series consists of well-drained soils that are moderately deep over sand and gravel. These soils formed in loamy material, and depth to the underlying loose gravel and sand ranges from 24 to 42 inches. Nineveh soils are nearly level and gently undulating and are on stream and outwash terraces. The native vegetation was mixed hardwoods and grasses.

In a representative profile, the surface layer is about 13 inches of dark-brown loam. The subsoil is about 23 inches thick. The upper 20 inches is firm, dark-brown gravelly clay loam. The lower 3 inches is dark reddish-brown gravelly clay loam. Tongues of this material extend 6 to 20 inches into the underlying material. The underlying material is at a depth of about 36 inches and consists of calcareous, yellowish-brown, pale-brown, and light-gray, loose, stratified sand and gravel.

The Nineveh soils are moderately permeable in the subsoil and very rapidly permeable in the underlying material. They have a low to moderate available moisture capacity. The organic-matter content is naturally high. The surface layer is medium acid unless it has been limed. These soils are droughty during long dry seasons. Most areas are used for crops, but some areas are used for urban development.

Representative profile of Nineveh loam, 0 to 2 percent slopes, in a cultivated field 300 feet north and 75 feet east of the southwest corner of sec. 26, T. 11 N., R. 5 E.

Ap—0 to 8 inches, dark-brown (7.5YR 3/2) loam, grayish brown (10YR 5/2) when dry; weak, medium, granular structure; friable when moist; few ¼- to 1-inch pebbles; few wormholes and worm casts; neutral; abrupt, smooth boundary.

A3—8 to 13 inches, dark-brown (7.5YR 3/2) loam; weak, medium, subangular blocky structure; friable when moist; few ¼- to ¾-inch pebbles; few 1- to 3-millimeter voids; neutral; clear, smooth boundary.

B21t—13 to 24 inches, dark-brown (7.5YR 4/4) gravelly clay loam; moderate, medium, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films continuous on faces of peds and on pebbles; few ½- to 1-inch pebbles; few 1- to 3-millimeter voids; neutral; clear, smooth boundary.

B22t—24 to 33 inches, dark-brown (7.5YR 4/4) gravelly clay loam; moderate, medium and coarse, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films continuous on faces of peds and on pebbles; neutral; clear, irregular boundary.

B3t—33 to 36 inches, dark reddish-brown (5YR 3/2) gravelly clay loam; weak, coarse, subangular blocky structure; firm when moist; dark reddish-brown (5YR 3/2) clay films continuous on faces of peds; neutral to mildly alkaline; abrupt, irregular boundary.

IIC—36 to 54 inches, yellowish-brown (10YR 5/4), pale-brown (10YR 6/3), and light-gray (10YR 7/2), loose, stratified gravel and sand; tongues of material from the B3t horizon extend to a depth of 45 to 58 inches and are 18 to 24 inches apart; calcareous; moderately alkaline.

The solum ranges from 24 to 42 inches in thickness but is normally 30 to 40 inches thick. The Ap horizon is dark brown (7.5YR 3/3 and 7.5YR 3/2 and 10YR 3/3) or very dark grayish brown (10YR 3/2). The A horizon is 10 to 15 inches thick. There is a brown (7.5YR 5/4) loam B1 horizon 2 to 4 inches thick in some areas. The B2 horizon is clay loam or gravelly clay loam and ranges from reddish brown (5YR 4/4) through dark brown (7.5YR 4/4). Tongues of material from the B3 horizon extend 6 to 20 inches into the IIC horizon and are 12 to more than 36 inches apart.

Nineveh, Fox, and Ockley soils are on similar terrain. Nineveh soils are darker colored than Fox soils. They are darker colored and have a thinner solum than Ockley soils, which are underlain by loose gravel and sand at a depth of 42 to 60 inches.

Nineveh loam, 0 to 2 percent slopes (NnA).—This nearly level soil is on terraces along the major streams in the county. These terraces are 4 to 20 feet above the adjacent flood plains. The soil areas range in size from 5 to more than 160 acres. This soil has the profile described as representative for the series. In places 30 to 50 percent of the soil at a depth of 40 to 48 inches consists of tongues of material from the subsoil extending into the underlying gravel and sand. In areas where this soil grades to Fox soils, the dark-colored surface layer is thinner and, in places, somewhat lighter in color.

Included in mapping are small areas of soils with a gritty silt loam, fine sandy loam, and gravelly loam surface layer. There are small areas of somewhat poorly drained and poorly drained soils in some of the narrow remnants of old stream channels. Also included are gently undulating Nineveh soils on small, elongated ridges.

Surface runoff is slow. This soil is droughty in dry seasons. It is suited to all crops common in the county. Fall-seeded small grains and deep-rooted crops, such as alfalfa, are least affected when rainfall is below normal. This soil is suited to irrigation. (Capability unit IIs–1)

Nineveh loam, 2 to 6 percent slopes (NnB).—This soil is on narrow, elongated ridges, on gently undulating areas, and on side slopes of drainageways on the terraces. The slopes are short and very irregularly shaped. Areas of this soil range in size from 3 to 20 acres and are commonly

intermixed with areas of Nineveh loam, 0 to 2 percent slopes.

This soil has a profile similar to that described as representative for the series, except that part of the original surface layer has been removed by erosion. The present surface layer consists of a mixture of material from the original surface layer and a moderate amount of material from the dark-brown gravelly clay loam subsoil. There generally are several pebbles on the surface of this soil. Depth to the underlying loose gravel and sand is 24 to 28 inches. Only a few tongues of subsoil extend into the underlying material.

Included in mapping are small areas of soils that have a gritty silt loam, fine sandy loam, and gravelly loam surface layer. There are a few small areas of severely eroded soils.

Runoff is slow to medium. Erosion is a hazard in the use and management of this soil. It is droughty during dry years. This soil is suited to all crops common in the county if it is managed properly and if erosion is controlled. The main crops are corn, soybeans, wheat, and alfalfa. Crops grown on this soil are affected by dry weather sooner than crops grown on Nineveh loam, 0 to 2 percent slopes. This soil is well suited to irrigation. (Capability unit IIe-9)

Ockley Series

The Ockley series consists of deep, nearly level, well-drained soils. These soils formed in a layer of loamy material and are underlain by stratified gravel and sand at a depth of 42 to 60 inches (fig. 11). They are on outwash terraces along the major streams. The native vegetation was hardwood forests.

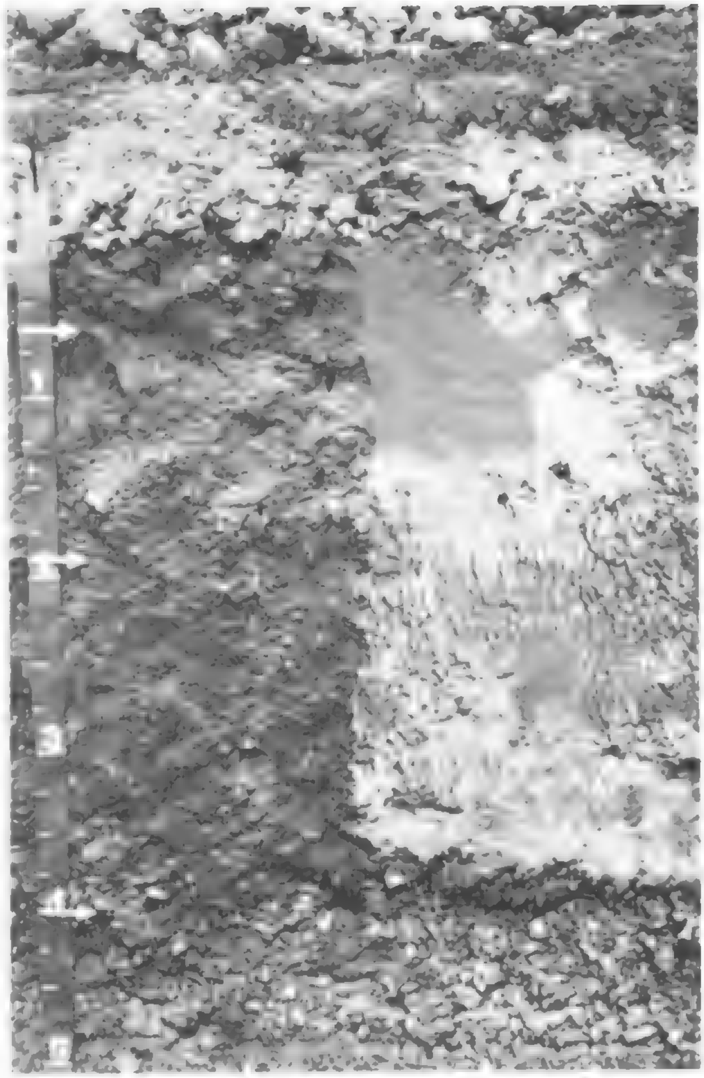

Figure 11.—**Profile of Ockley loam, 0 to 2 percent slopes.**

In a representative profile, the surface layer is about 8 inches of brown loam. The 3-inch subsurface layer is grayish-brown loam. The subsoil is about 35 inches thick. The upper 5 inches is firm, reddish-brown clay loam; the middle 21 inches is firm, dark-brown clay loam; and the lower 9 inches is firm, dark reddish-brown gravelly clay loam. Tongues of material from the lower part of the subsoil extend into the underlying material. The underlying material is at a depth of about 46 inches and consists of yellowish-brown and pale-brown, calcareous, stratified loose gravel and sand.

The Ockley soils are moderately permeable in the solum and very rapidly permeable in the underlying material. The surface layer is medium acid unless it has been limed. These soils are naturally low in organic-matter content and have a high available moisture capacity. Most areas are used for crops.

Representative profile of Ockley loam, 0 to 2 percent slopes, in a cultivated field 1,420 feet west and 1,240 feet south of the northeast corner of sec. 14, T. 13 N., R. 5 E.

Ap—0 to 8 inches, brown (10YR 5/3) loam; weak, medium, granular structure; friable when moist; few roots; few fine voids less than 1 millimeter in diameter; few worm casts; neutral; abrupt, wavy boundary.

A2—8 to 11 inches, grayish-brown (10YR 5/2) loam; weak, thin, platy structure; friable when moist; few fine voids less than 1 millimeter in diameter; few roots; neutral; abrupt, smooth boundary.

B21t—11 to 16 inches, reddish-brown (5YR 4/3) clay loam; moderate, medium, subangular blocky structure; firm when moist; dark reddish-brown (5YR 3/3) clay films continuous on faces of peds; few ¼- to ½-inch pebbles; few dark-brown (7.5YR 4/2) worm casts; few wormholes and voids 1 to 3 millimeters in diameter; strongly acid; clear, smooth boundary.

B22t—16 to 29 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure and some angular blocky; firm when moist; dark-brown (7.5YR 3/2) clay films continuous on faces of peds; few ½- to 1-inch pebbles; few fibrous roots; few wormholes; few dark-brown (7.5YR 3/2) worm casts; medium acid; clear, wavy boundary.

B23t—29 to 37 inches, dark-brown (7.5YR 4/4) clay loam; weak, coarse, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films continuous on faces of peds; few fine fibrous roots; few dark-brown (7.5YR 3/2) worm casts; few ½- to 1-inch pebbles; medium acid; clear, wavy boundary.

B24t—37 to 46 inches, dark reddish-brown (5YR 3/4) gravelly clay loam; weak, coarse, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films on faces of peds and clay coatings on pebbles; few decomposing limestone pebbles in lower part; few, fine, fibrous roots; tongues of this horizon extend into the next lower horizon; slightly acid in the upper part, becoming mildly alkaline in lower part; abrupt, irregular boundary.

C—46 to 60 inches, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) stratified gravel and sand; calcareous; moderately alkaline.

The solum ranges from 42 to 60 inches in thickness, but is mainly 42 to 50 inches thick. The Ap horizon is brown (10YR 5/3), yellowish brown (10YR 5/4), or dark yellowish brown (10YR 4/4). The A2 horizon is lacking in some places. In some areas there is a 2- to 5-inch B1 horizon of brown (10YR 5/3) loam. The upper B2 horizon is clay loam or sandy clay loam. The lower part of the B2 horizon is clay loam or gravelly clay loam. The B2 horizon is dark reddish brown (5YR 3/4), reddish brown (5YR 4/3), or dark brown (7.5YR 4/4). In some areas there is a B3 horizon of dark-brown (7.5YR 3/2) or dark reddish-brown (5YR 3/4) gravelly clay loam.

Ockley, Fox, and Nineveh soils formed in similar materials and occupy similar terrain. Ockley soils have a thicker solum than Fox and Nineveh soils and are lighter colored than Nineveh soils. The well-drained Ockley soils are closely associated on the landscape with the very poorly drained Westland soils, the somewhat poorly drained Sleeth soils, and the well-drained Fox soils.

Ockley loam, 0 to 2 percent slopes (OcA).—This nearly level soil is on the outwash plains and stream terraces along the major streams. The soil areas range in size from 2 to 80 acres.

Included in mapping are small areas that have a gritty silt loam surface layer. In a few places depth to the loose gravel and sand is less than 42 inches. In some places tongues of the lower part of the subsoil are 3 feet apart and extend to a depth of about 50 inches, and there is loose gravel and sand at a depth of about 36 inches between the tongues. In areas where the seasonal water table is at a depth of 40 to 50 inches, there are a few faint mottles below a depth of 30 inches. Some areas have a calcareous gravelly loam layer at a depth of 30 to 40 inches, and this layer is underlain by loose gravel and sand at a depth below 48 inches.

There are no severe limitations to use of this soil. Surface runoff is slow, and the erosion hazard is slight. This soil is somewhat droughty in extremely long dry seasons. It is suited to all crops common in the county. (Capability unit I–1)

Parke Series

The Parke series consists of deep, well-drained soils. These soils formed in a mantle of loess 18 to 42 inches thick and in the underlying strongly weathered, reddish, sandy and gravelly outwash material. Stratified, calcareous sand and gravel are generally at a depth of 10 to 15 feet. These gently sloping to sloping soils are on ridges. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 7 inches of brown silt loam. The subsoil extends to a depth of more than 60 inches and has four main parts. The upper 7 inches is dark yellowish-brown, friable silt loam; the next 10 inches is firm, dark-brown silty clay loam; the next 26 inches is firm, yellowish-red sandy clay loam; and the lower 10 inches is friable, yellowish-red sandy clay loam to sandy loam. The underlying material is loose, stratified, calcareous gravel and sand and is at a depth of about 144 inches.

Permeability is moderate. The available moisture capacity is high. These soils are naturally low in organic-matter content. The surface layer is strongly acid unless it has been limed. Erosion is the main hazard if these soils are cultivated. They are used for crops, pasture, and trees.

Representative profile of Parke silt loam, 2 to 6 percent slopes, eroded, in a cultivated field 240 feet south and 820 feet west of the northeast corner of the NW$\frac{1}{4}$ sec. 31, T. 11 N., R. 6 E.

Ap—0 to 7 inches, brown (10YR 4/3) silt loam; weak, fine and medium, granular structure; friable when moist; few pebbles on the surface; a few pieces of subsoil mixed into the matrix; medium acid; abrupt, smooth boundary.

B1t—7 to 14 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; moderate, medium, subangular blocky structure; friable when moist; few patchy clay films on faces of peds; very strongly acid; clear, smooth boundary.

B21t—14 to 24 inches, dark-brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm when moist; dark-brown (7.5YR 4/4) clay films continuous on faces of peds; a few fine sand grains; very strongly acid; clear, smooth boundary.

IIB22tb—24 to 50 inches, yellowish-red (5YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure in the upper 10 inches and gradually becoming weaker and coarser with depth; firm when moist; yellowish-red (5YR 5/6 and 4/6) clay films on faces of peds; clay bridging between sand grains; few pebbles; few black concretions in lower 6 inches; very strongly acid; gradual, wavy boundary.

IIB3tb—50 to 144 inches, yellowish-red (5YR 5/6) light sandy clay loam gradually changing to sandy loam; streaks of red (2.5YR 4/6 and 4/8) and reddish yellow (5YR 6/6); massive to weak, coarse, subangular blocky structure; friable when moist; red (2.5YR 4/6) clay bridging between sand grains; layers of gravelly clay loam to gravelly loam; very strongly acid and becoming neutral in the lower part; gradual, irregular boundary.

IIC—144 to 155 inches, loose, moderately alkaline, calcareous sand and some gravel layers.

The loess ranges from 18 to 42 inches in thickness but is mainly less than 30 inches. The Ap horizon is brown (10YR 4/3) or dark yellowish brown (10YR 4/4). In some areas there is an A2 horizon 3 to 6 inches thick that is dark grayish-brown (10YR 4/2) silt loam. In wooded areas the A1 horizon is 1 to 3 inches thick and is very dark grayish-brown (10YR 3/2) silt loam. The lower part of the B2 horizon is clay loam, gravelly clay loam, or sandy clay loam. The B3 horizon is generally at a depth of 45 to 65 inches. The loose, calcareous gravel and sand are at a depth of 10 to 15 feet but are lacking in some areas.

Parke soils are associated in Shelby County with Negley, Miami, and Fox soils. The Parke soils are thicker, more acid, and have fewer pebbles in the upper part of the solum than Fox soils, which formed in gravel and sand that is loose at a depth of 24 to 42 inches. The Parke soils are thicker, redder, more acid, and have fewer pebbles in the upper part of the solum than Miami soils, which formed in loam till that is calcareous at a depth of 24 to 42 inches. The Parke soils have fewer pebbles in the upper part of the solum than Negley soils, which formed in similar material except that the mantle of loess is only 0 to 18 inches thick.

Parke silt loam, 2 to 6 percent slopes, eroded (PaB2).—This gently sloping, eroded soil is on ridges. It has the profile described as representative for the series.

Included in mapping are a few small areas of severely eroded soils. A few small areas of Miami soils and Fox soils are also included. In a few areas the upper part of the soil has characteristics of Miami soils, and the lower part has characteristics of Parke soils. Runoff is slow or medium. Erosion is the main hazard.

If properly managed and if erosion is controlled, this soil is suited to all crops common in the county. It is also suited to pasture. It is suited to trees and is ideally suited

to deep-rooted trees, such as black walnut. (Capability unit IIe-1)

Parke silt loam, 6 to 12 percent slopes, eroded (PaC2).—This sloping, eroded soil is on hillsides and side slopes of drainageways and on ridges.

Included in mapping are a few small areas of severely eroded soils and Miami and Fox soils. In some areas the upper part of the slopes includes areas of Miami soils, and the lower part of the slopes is Parke soils. In a few places the upper part of the profile is typical of Miami soils, and the lower part is typical of Parke soils. Runoff is medium. Erosion is the main hazard.

This soil is suited to all crops common in the county if it is properly managed and erosion is controlled. It is suited to permanent pasture and hay. It is suited to trees and is ideally suited to deep-rooted trees, such as black walnut. (Capability unit IIIe-1)

Princeton Series

The Princeton series consists of deep, well-drained soils underlain by calcareous fine sand at a depth of 42 to 60 inches. These soils are on somewhat hummocky sandy ridges. They formed in calcareous fine sand. The native vegetation was hardwood forest.

In a representative profile, the surface is about 7 inches of dark-brown fine sandy loam. The subsurface layer is about 5 inches of yellowish-brown fine sandy loam. The subsoil is about 35 inches thick. The uppermost 3 inches is friable, dark-brown loam; the middle 23 inches is firm, dark-brown sandy clay loam; and the lower 9 inches is friable, brown sandy loam. The underlying material is yellowish-brown and dark yellowish-brown, calcareous fine sand and minor amounts of silt.

Permeability is moderate in the solum and moderately rapid in the underlying material. The surface layer is medium acid unless it has been limed. The organic-matter content is low. Available water capacity is moderate to high.

These soils are mainly used for crops, but a few areas are in permanent pasture and woodland. Melons and other specialty crops are grown in some areas.

Representative profile of Princeton fine sandy loam, 2 to 6 percent slopes, in a cultivated field 660 feet west and 20 feet south of the northeast corner of the SE¼ sec. 24, T. 12 N., R. 5 E.

Ap—0 to 7 inches, dark-brown (10YR 4/3) fine sandy loam; weak, medium, granular structure; very friable when moist; few dark-brown (10YR 3/3) worm casts; many roots; neutral; abrupt, smooth boundary.

A2—7 to 12 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, medium, granular structure; very friable when moist; few 2- to 4-millimeter voids; few worm casts and wormholes; many roots; neutral; clear, smooth boundary.

B1—12 to 15 inches, dark-brown (10YR 4/3) heavy loam; weak, medium, subangular blocky structure; friable when moist; few 1- to 4-millimeter root channels and wormholes; few dark-brown (10YR 3/3) worm casts; slightly acid; clear, smooth boundary.

B21t—15 to 26 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, medium, subangular blocky structure; firm when moist; continuous, reddish-brown (5YR 4/4) clay films on ped faces; strongly acid; gradual, smooth boundary.

B22t—26 to 38 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, coarse, subangular blocky structure; firm when moist; continuous, reddish-brown (5YR 4/4) clay films on ped faces; few old holes filled with streaks of dark yellowish-brown sand; strongly acid; clear, wavy boundary.

B23t—38 to 47 inches, brown (7.5YR 5/4) heavy sandy loam; weak, coarse, subangular blocky structure; friable when moist; dark-brown (7.5YR 4/4) clay films on some ped faces; medium acid in upper part and slightly acid in lower part; clear, wavy boundary.

C—47 to 65 inches, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/4 and 10YR 5/6) fine sand and some minor streaks of silt; neutral to a depth of 57 inches; calcareous, moderately alkaline at a depth below 57 inches.

The thickness of the solum ranges from 42 to 60 inches. The color of the Ap horizon ranges from dark brown to brown or dark grayish brown. In uncultivated areas the A1 horizon is very dark grayish-brown sandy loam 1 to 4 inches thick. Some profiles lack the B1 horizon. The B2 horizon is dark brown (7.5YR 4/4), reddish brown (5 YR 5/4 and 5/6), or yellowish brown (10YR 5/4 and 5/6). It is sandy clay loam or clay loam in the upper part and sandy loam or sandy clay loam in the lower part. A B3 horizon of dark reddish-brown (5YR 3/4) or dark-brown (7.5YR 4/4) sandy loam occurs in some profiles.

Princeton soils are similar to Martinsville and Ockley soils in thickness and color. In most areas Princeton soils have more sand in the subsoil than Martinsville soils, which have a clay loam subsoil and are underlain by stratified sand and silt. Princeton soils have less gravel in the profile than Ockley soils, which formed in gravel and sand. Princeton soils are well drained and are generally closely associated with the somewhat poorly drained Ayrshire soils.

Princeton fine sandy loam, 0 to 2 percent slopes (PrA).—This soil is in the western part of the county near sandy ridges.

Included in mapping are small areas of somewhat poorly drained soils and soils that have a loam surface layer. Also included are a few small areas of gently undulating soils.

Runoff is slow, and this soil is somewhat droughty during long dry seasons. It is suited to all crops common in the county. It is also suited to woodland, especially deep-rooted trees, such as black walnut. This soil is well suited to irrigation. (Capability unit IIs-5)

Princeton fine sandy loam, 2 to 6 percent slopes (PrB).—This gently undulating soil is on short slopes and broad ridgetops. It has the profile described as representative for the series. The areas are irregularly shaped and range in size from 3 acres to more than 40 acres.

Included in mapping are areas where the plow layer is a mixture of the original surface layer and a moderate amount of the dark-brown loam or sandy clay loam subsoil. Also included are small areas of nearly level soils and some severely eroded soils. Ayrshire soils are in a few small, low areas between ridges. A few areas of soils that have a loam surface layer are also included.

Runoff is slow, and erosion is the main hazard. If this soil is properly managed and erosion is controlled, it is suited to all crops common in the county and to such specialty crops as melons. It is suited to woodland and well suited to such deep-rooted trees as black walnut. This soil is suited to irrigation. (Capability unit IIe-11)

Princeton fine sandy loam, 6 to 12 percent slopes (PrC).—This rolling soil is on areas that resemble dunes. In some areas the surface layer consists of a mixture of the original surface layer and a moderate amount of the dark-brown sandy clay loam subsoil.

Included in mapping are a few small areas of soils that have a loam surface layer. In some severely eroded areas

the sandy clay loam subsoil is exposed at the surface. A few small areas of somewhat poorly drained soils are at the base of some slopes and in low swales between ridges. Also included are soils that have bands of fine sandy loam and sandy clay loam in the subsoil and a few areas of moderately steep soils.

Runoff is medium. Erosion is the major hazard in use and management of this soil. If the soil is properly managed and erosion is controlled, it is suited to all crops common in the county and to such specialty crops as melons. It is suited to woodland and is well suited to such deep-rooted trees as black walnut. (Capability unit IIIe-15)

Quarries

Quarries (Qu) (fig. 12) are in the southeastern part of the county. They are mainly in the area near Flatrock River between St. Paul and Flat Rock, where depth to limestone is relatively shallow. There are several small abandoned quarries. There are a few larger quarries now in operation. Some of the limestone is crushed fine for farm use. Limestone is also crushed and used as aggregate in concrete and for road surfacing. A small amount is quarried for use as building stone.

Some abandoned pits have filled with water and are suitable for being stocked with fish and developed for wildlife. The shrubs and other woody plants growing in old spoil areas provide habitat for wildlife. (Capability unit VIIIs-2)

Randolph Series

The Randolph series consists of moderately deep, somewhat poorly drained soils. These soils formed in a thin layer of glacial drift and are underlain by limestone bedrock at a depth of 24 to 42 inches. They are nearly level and are on terraces and uplands. These soils formed under a hardwood vegetation.

In a representative profile, the surface layer is about 7 inches of dark grayish-brown silt loam underlain by about 2 inches of grayish-brown silt loam. The subsoil is about 18 inches thick. The upper 14 inches is firm, grayish-brown or brown silty clay loam that has yellowish-brown, dark-brown, and pale-brown mottles. The lower 4 inches is firm, dark-brown clay that has dark reddish-brown and yellowish-brown mottles. The underlying limestone bedrock is at a depth of about 27 inches.

Randolph soils have moderately slow permeability. They have a low to moderate available moisture capacity and are naturally low in organic-matter content. The surface layer is medium acid or slightly acid unless it has been limed. These soils are somewhat droughty during long dry seasons. Excessive wetness is the main limitation

Figure 12.—Limestone quarry near St. Paul in an area that is shallow to bedrock.

to the use and management of these soils. They are mainly used for crops, but a few areas are in pasture.

Representative profile of Randolph silt loam, in a cultivated field 500 feet east and 240 feet south of the northwest corner of the SW¼ of sec. 22, T. 11 N., R. 7 E.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable when moist; many fine voids less than 1 millimeter in diameter; few wormholes and worm casts; neutral; abrupt, smooth boundary.

A2—7 to 9 inches, grayish-brown (10YR 5/2) silt loam; few, fine, distinct, yellowish-brown (10YR 5/4) mottles; weak, thin, platy structure breaking to weak, medium, granular; friable when moist; many fine voids less than 1 millimeter in diameter; few 1- to 3-millimeter wormholes and worm casts; neutral; abrupt, smooth boundary.

B1—9 to 13 inches, grayish-brown (10YR 5/2) light silty clay loam; many, medium, distinct, dark-brown (10YR 4/3) and yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; slightly firm when moist; patchy very dark grayish-brown (10YR 3/2) clay films on faces of some peds; few 1- to 4-millimeter voids and wormholes; slightly acid; clear, smooth boundary.

B21t—13 to 17 inches, grayish-brown (10YR 5/2) silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/4) and dark-brown (7.5YR 4/4) mottles; moderate, medium, subangular blocky structure; firm when moist; dark-brown (7.5YR 4/2) clay films continuous on faces of peds; few 2- to 4-millimeter voids and wormholes; few dark grayish-brown (10YR 4/2) worm casts; slightly acid; clear, smooth boundary.

B22t—17 to 23 inches, brown (10YR 4/3) heavy silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) mottles; moderate, medium, subangular and angular blocky structure; firm when moist; dark-brown (7.5YR 4/2) clay films continuous on faces of peds; a few sand grains; slightly acid; clear, smooth boundary.

IIB23t—23 to 27 inches, dark-brown (7.5YR 3/2) clay; common, medium, prominent, dark reddish-brown (5YR 3/3) and yellowish-brown (10YR 5/4) mottles; weak, coarse, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films mainly in vertical cracks; several decomposing limestone fragments; tongues of this material extend into cracks in the limestone; moderately alkaline; calcareous; abrupt, irregular boundary.

R—27 inches +, limestone bedrock.

The solum ranges from 24 to 40 inches in thickness. The Ap horizon is dark grayish brown (10YR 4/2) or dark gray (10YR 4/1). The A2 horizon generally contains enough sand to feel gritty. The A2 horizon is lacking in some areas, especially those that have been plowed exceptionally deep. The B21t horizon is silty clay loam or clay loam. The B22t horizon is heavy silty clay loam, silty clay, or clay. It is brown (10YR 4/3), dark yellowish brown (10YR 4/2), or dark grayish brown (10YR 4/2).

Randolph, Crosby, and Whitaker soils have similar drainage and occupy similar terrain. Randolph soils are thinner over a limiting layer and have a finer textured subsoil than Crosby soils, which formed in loam till, and Whitaker soils, which formed in stratified sand and silt. The somewhat poorly drained Randolph soils are similar in thickness to the well-drained Milton soils and the very poorly drained Millsdale soils and are closely associated with them on the landscape.

Randolph silt loam (0 to 2 percent slopes) (Ra).—This nearly level soil is underlain by limestone bedrock at a depth of 24 to 42 inches.

Included in mapping are small areas of moderately well drained soils that are mottled at a depth of 18 to 30 inches. There are small areas of soils included that are deeper than 42 inches over bedrock. In some profiles flaggy stone is just above the solid bedrock. In most areas in Shelby County the glacial drift over the limestone consists of outwash material.

Runoff is slow or very slow. Wetness is the main limitation. This soil is suited to all crops common in the county if it is properly managed and adequately drained. The main crops are corn, soybeans, and small grains. This soil is also used for meadow. Because of the shallowness of bedrock, certain types of drainage systems, such as tile, are difficult to install. (Capability unit IIIw–7)

Rensselaer Series

The Rensselaer series consists of deep, very poorly drained soils. These soils formed in stratified sand and silt. They are in low depressions on outwash and stream terraces throughout the county. The native vegetation was water-tolerant hardwoods and shrubs and some sedges and grasses.

In a representative profile, the surface layer is about 14 inches of clay loam. The upper 7 inches is very dark gray, and the lower 7 inches is black. The subsoil is about 34 inches thick. The upper 22 inches is firm, dark-gray clay loam mottled with light olive brown, olive brown, and yellowish brown. The lower 12 inches is firm, gray sandy clay loam mottled with light olive brown and yellowish brown. The underlying material is at a depth of 48 inches and consists of stratified, calcareous sand and some silt.

The Rensselaer soils are naturally high in organic-matter content. The surface layer is naturally slightly acid or neutral. These soils have a high available moisture capacity and slow permeability. Excessive wetness is the main limitation to the use and management of these soils. The water table is near the surface during wet weather, and surface water ponds following periods of high rainfall. Most areas are used for crops.

Representative profile of Rensselaer clay loam, in a cultivated field 660 feet north and 150 feet west of the southeast corner of sec. 36, T. 11 N., R. 5 E.

Ap—0 to 7 inches, very dark gray (10YR 3/1) clay loam; weak, medium, granular structure; firm when moist; many roots; several 1- to 3-millimeter wormholes and worm casts; neutral; abrupt, smooth boundary.

A12—7 to 14 inches, black (10YR 2/1) clay loam; moderate, medium, subangular blocky structure; firm when moist; shiny, black (10YR 2/1), organic films on faces of peds; few 1- to 3-millimeter wormholes and voids; some black (10YR 2/1) worm casts; many roots; neutral; clear, smooth boundary.

B21tg—14 to 23 inches, dark-gray (N 4/0) clay loam; common, medium, distinct, olive-brown (2.5Y 4/4) and yellowish-brown (10YR 5/6 and 10YR 5/8) mottles; weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm when moist; dark-gray (N 4/0) clay films continuous on faces of peds; few 1- to 4-millimeter voids and wormholes; neutral; gradual, smooth boundary.

B22tg—23 to 36 inches, dark-gray (10YR 4/1) clay loam; many, medium, distinct, light olive-brown (2.5Y 5/4 and 5/6) and yellowish-brown (10YR 5/4 and 5/6) mottles; weak, coarse, prismatic structure breaking to moderate, medium and coarse, subangular blocky; firm when moist; dark-gray (N 4/0) clay films continuous on faces of peds; few 1- to 4-millimeter voids and wormholes; neutral; clear, smooth boundary.

B3g—36 to 48 inches, gray (N 5/0) light sandy clay loam; common, light olive-brown (2.5Y 5/4) and yellowish-brown (10YR 5/4 and 5/6) mottles; weak, coarse, subangular blocky structure; firm when

moist; dark-gray (N 4/0) clay films discontinuous on faces of peds; neutral; clear, wavy boundary.

Cg—48 to 60 inches, gray (10YR 5/1 and 6/1) and dark-gray (N 4/0) sand and strata of silt; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; friable; moderately alkaline; calcareous.

The solum ranges from 34 to 48 inches in thickness. The Ap horizon is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). In some areas there is a B1 horizon of dark-gray (10YR 4/1) clay loam 3 to 5 inches thick. The B2 horizon is gray (N 5/0 or 10YR 5/1), dark gray (N 4/0 or 10YR 4/1), or dark grayish brown (10YR 4/2 or 2.5Y 4/2). The B2 horizon is dominantly clay loam or silty clay loam but in some places it is sandy clay loam. The B3 horizon is lacking in some areas.

Rensselaer, Brookston, and Westland soils are similar in thickness, and all three soils are in depressions. Rensselaer soils have few pebbles in the subsoil and stratified sand and silt is at a depth of less than 60 inches, whereas Brookston soils have pebbles in the subsoil and clay loam till is at a depth of less than 60 inches. Westland soils have pebbles throughout the profile, have a gravelly clay loam B3 horizon, and are underlain by stratified gravel and sand. The very poorly drained Rensselaer soils are generally associated on the landscape with the somewhat poorly drained Whitaker soils and the well-drained Martinsville soils.

Rensselaer clay loam (0 to 2 percent slopes) (Re).—This very poorly drained soil is in depressions and elongated old stream meanders on terraces that are underlain by stratified sand and silt. The soil areas are irregularly shaped and range in size from 5 to more than 40 acres.

Included in mapping are small areas of soils that have a loam and silt loam surface layer. In a few areas there are layers of clay and silty clay in the lower subsoil. There are a few small areas of Whitaker soils and Westland soils included. A few small areas of this soil are intermixed with Princeton and Ayrshire soils.

Wetness is the main limitation. Runoff is slow or very slow. Water is ponded on the surface during wet seasons. If this soil is adequately drained and properly managed, it is suited to all crops common in the county. Corn and soybeans are the main crops grown. This soil, if worked when too wet, is subject to puddling and becomes hard and cloddy upon drying. (Capability unit IIw–1)

Rodman Series

The Rodman series consists of well-drained soils that are shallow over sand and gravel. These soils formed in calcareous, gravelly and sandy material and are on narrow terrace escarpments, breaks, and kames. The natural vegetation was hardwood forests.

In a representative profile, the surface layer is about 7 inches of dark-brown gravelly loam. The subsoil is about 6 inches of friable, dark-brown gravelly loam. The underlying material is at a depth of about 13 inches and consists of calcareous, loose, stratified gravel and sand.

Rodman soils have a very low available moisture capacity. The surface layer and subsoil are moderately rapidly permeable, and the underlying material is very rapidly permeable. The organic-matter content of the surface layer is high in wooded areas and low on exposed slopes. The surface layer is naturally neutral to mildly alkaline.

These soils are well suited to woodland and permanent pasture.

Representative profile of Rodman gravelly loam, 18 to 35 percent slopes, in a wooded area 160 feet north and 574 feet east of the southwest corner of sec. 12, T. 13 N., R. 5 E.

A—0 to 7 inches, dark-brown (7.5YR 3/2) gravelly loam; moderate, medium, granular structure; friable when moist; neutral; clear, smooth boundary.

B—7 to 13 inches, dark-brown (7.5YR 4/4) gravelly loam; weak, fine, subangular blocky structure; friable when moist; few thin films on peds; pinkish-gray (7.5YR 7/2) limy streaks in lower part; few decomposing limestone pebbles; neutral in upper part and mildly alkaline in lower part; abrupt, smooth boundary.

C—13 to 24 inches +, dark yellowish-brown (10YR 4/4) and gray (10YR 6/1) gravel and sand; single grain; loose; light-gray (10YR 7/2) decomposing stones; calcareous; moderately alkaline.

The solum ranges from 8 to 15 inches in thickness. The A horizon is very dark brown (7.5YR 3/2), dark brown (10YR 3/3), or very dark grayish brown (10YR 3/2). The B horizon is dark-brown (7.5YR 4/4) or dark yellowish-brown (10YR 3/4 and 4/4) gravelly loam or loam.

Rodman, Hennepin, and Corydon soils are similar in thickness and are on similar terrain. The Rodman soils are coarser textured than the Hennepin and Corydon soils. Rodman soils also differ from Corydon soils in lacking the large stones throughout the soil. They are underlain by gravel and sand at a depth of 10 to 20 inches instead of by limestone bedrock, as are the Corydon soils. The shallow Rodman soils are closely associated on the landscape with the moderately deep Fox and Nineveh soils and the deep Ockley soils.

Rodman gravelly loam, 18 to 35 percent slopes (RoE).—This steep soil is on breaks and slopes of drainageways along the level terrace areas and is on the sides of kames.

Included in mapping near the crest of some slopes is a soil in which the subsoil is gravelly clay loam 10 to 15 inches thick. Also included are some severely eroded soils in which the dark surface layer has been removed and spots of loose gravel are exposed. On the kames near Marietta, small areas of Hennepin soils are included. On the high ridges in Jackson Township, there are some areas of Negley soils included, and there are some large chunks of cemented gravel on the surface of the soil and in the underlying gravel.

On the kames and the high ridges in Jackson Township, this soil has more silt and clay in the underlying material. It therefore has a slightly higher available moisture capacity than it does in other sections of the county. Runoff is rapid or very rapid. Use of this soil is severely limited by droughtiness. This soil is suited to woodland or permanent pasture. It is better suited to early spring pasture than to summer pasture, because growth in summer is likely to be limited by lack of moisture. (Capability unit VIIs–1)

Ross Series

The Ross series consists of deep, well-drained soils on flood plains along the major streams. These soils formed in neutral or moderately alkaline alluvial material. The native vegetation was mixed hardwoods and grasses.

In a representative profile, the surface layer is about 36 inches thick. The upper 17 inches is very dark brown silt loam, and the lower 19 inches is friable, very dark brown loam that has blocky structure. The underlying material, at a depth of 36 inches, is dark-gray, stratified silt loam and loam that is neutral in reaction.

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Ross soils have a high available moisture capacity and are moderately permeable. They are high in organic-matter content and are neutral in reaction. They are subject to flooding during winter and early in spring. Ross soils are used mainly for crops, but a few areas that are irregularly dissected by meandering stream channels are used for permanent pasture or trees.

Representative profile of Ross silt loam, in a cultivated field 30 feet north and 50 feet west of the southeast corner of SW¼ sec. 31, T. 12 N., R. 6 E.

Ap—0 to 8 inches, very dark brown (10YR 2/2) silt loam, very dark grayish brown (10YR 3/2) when crushed; weak, fine, granular structure; friable when moist; several very dark brown (10YR 2/2) worm casts; neutral; abrupt, smooth boundary.

A12—8 to 17 inches, very dark brown (10YR 2/2) silt loam, very dark grayish brown (10YR 3/2) when crushed; moderate, medium, granular structure; friable when moist; several wormholes and voids 1 to 3 millimeters in diameter; several very dark brown (10YR 2/2) worm casts; common roots; neutral; gradual, smooth boundary.

A13—17 to 36 inches, very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) when crushed; moderate, medium, subangular blocky structure; friable when moist; few roots; thin organic films on ped faces; few sand grains; few voids and wormholes 1 to 4 millimeters in diameter; neutral; clear, smooth boundary.

C—36 to 53 inches, dark-gray (10YR 4/1) stratified silt loam and loam; massive; friable when moist; neutral.

The A horizon is very dark brown (10YR 2/2), dark brown (10YR 3/3), or very dark grayish brown (10YR 3/2). It ranges from 24 to 38 inches in thickness. The Ap and A12 horizons contain enough sand to feel gritty. The A13 horizon ranges from loam to silt loam. The C horizon is loam, clay loam, or silt loam, and loose gravel occurs at a depth of more than 50 inches in places.

Ross and Genesee soils formed in similar material and are on similar landscapes. Ross soils have a darker colored surface layer than Genesee soils. The well-drained Ross soils are closely associated on the landscape with the moderately well drained Medway soils.

Ross silt loam (0 to 2 percent slopes) (Rt).—This nearly level, well-drained soil is on the flood plains along some of the major streams in the county.

Included in mapping are a few small areas that have a light silty clay loam and loam surface layer. Moderately well drained Medway soils and somewhat poorly drained Shoals soils are included in small low areas. Also included are some soils that are dark colored only to a depth of 16 to 24 inches.

Runoff is slow or very slow. The main hazard in use and management of this soil is flooding during winter and early in spring. In some places there is occasional flooding of short duration during some growing seasons. This soil is suited to corn, soybeans, and other annual row crops. Fall-seeded small grains are likely to be damaged by winter and spring overflow. In areas protected by levees or where the flooding is only occasional, this soil is suited to all crops common in the county. (Capability unit I–2)

Ross Series, Moderately Deep Variant

The Ross series, moderately deep variant, consists of well-drained soils on flood plains. These soils are underlain at a depth of 18 to 36 inches by loose gravel and sand (fig. 13).

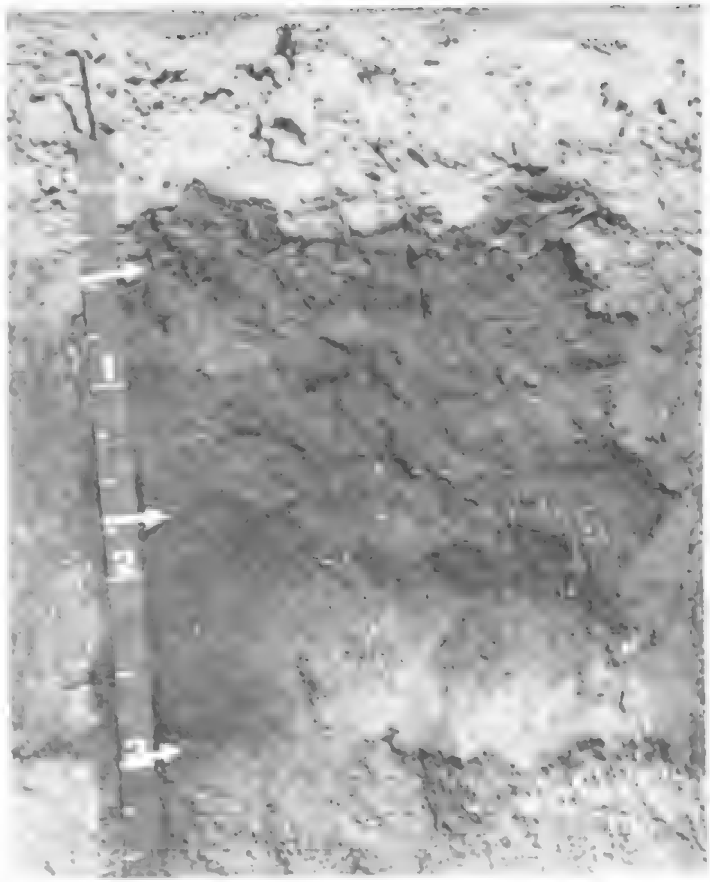

Figure 13.—Profile of Ross loam, moderately deep variant.

In a representative profile, the surface layer is about 30 inches thick. The upper 19 inches is dark-brown loam, the next 8 inches is dark-brown gravelly loam, and the lower 3 inches is very dark grayish-brown gravelly loam. The underlying material is at a depth of 30 inches and consists of loose, calcareous, stratified gravel and sand.

These soils are moderately rapidly permeable in the subsoil and rapidly permeable in the underlying material. They have a low to moderate available moisture capacity. The surface layer is neutral to moderately alkaline. In low areas these soils are subject to flooding during winter or early in spring. They are somewhat droughty during dry seasons.

Representative profile of Ross loam, moderately deep variant, in a cultivated field 250 feet east and 380 feet north of the southwest corner of SE¼ sec. 3, T. 12 N., R. 6 E.

Ap—0 to 10 inches, dark-brown (10YR 3/3 when rubbed) loam; weak, medium, granular structure to cloddy; friable when moist; common pebbles ½ inch to 1 inch in diameter; traffic pan 1 inch thick in lower part of horizon; calcareous; moderately alkaline; abrupt, smooth boundary.

A12—10 to 19 inches, dark-brown (10YR 3/3 when rubbed) loam; weak, medium, subangular blocky structure; friable when moist; very dark grayish-brown (10YR 3/2), organic coatings on faces of peds and on pebbles; common ⅛- to 1-inch pebbles; very dark grayish-brown (10YR 3/2) worm casts; calcareous; moderately alkaline; clear, wavy boundary.

A13—19 to 27 inches, dark-brown (10YR 3/3) gravelly loam; moderate, medium, subangular blocky structure; slightly firm when moist; very dark grayish-brown (10YR 3/2) organic coatings on some faces of peds and on pebbles; common ½- to 1-inch pebbles; calcareous; moderately alkaline; clear, wavy boundary.

A14—27 to 30 inches, very dark grayish-brown (10YR 3/2) gravelly loam; massive; very friable when moist; dark-brown (7.5YR 3/2) organic coatings on pebbles; calcareous; moderately alkaline; abrupt, broken boundary.

C—30 to 72 inches, loose, stratified, moderately alkaline, calcareous gravel and sand.

The solum ranges from 24 to 36 inches in thickness but is mainly 24 to 30 inches thick. The A horizon is dark brown (7.5YR 3/2 or 10YR 3/3), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). The A12, A13, and A14 horizons are loam, gravelly loam, or sandy loam.

Ross soil, moderately deep variant, Genesee soil, sandy variant, Ross soils, and Genesee soils occupy similar terrain. The Ross soil, moderately deep variant, differs from the Genesee soil, sandy variant, in having a higher percentage of pebbles throughout the profile and in having a finer textured solum and gravelly underlying material. It is coarser textured and darker colored than Genesee soils of the regular series. It is thinner and coarser textured than the Ross soils. Ross soils, moderately deep variant, is associated on the landscape with the well-drained Ross soils, the moderately well drained Medway soils, and the very poorly drained Saranac and Westland soils.

Ross loam, moderately deep variant (0 to 2 percent slopes) (Rs).—This soil is on the flood plains.

About 30 percent of the soil areas have loose gravel and sand at a depth of less than 24 inches, and in a few areas the loose gravel is in the plow layer. A few small areas of Ross soils are included in mapping. There are a few small areas of Shoals, Saranac, and Westland soils included in old stream meanders.

Runoff is slow. This soil is subject to flooding during winter and early in spring, except in areas protected by levees. It is droughty at some time during a normal growing season. This soil is suited to annual row crops common in the county, but crops that are somewhat drought-tolerant, such as grain sorghum, are better suited than corn. Fall-seeded small grains are likely to be damaged by winter and spring flooding unless the area is protected or flooding is only occasional. (Capability unit IIs–6)

Saranac Series

The Saranac series consists of deep, very poorly drained soils. These soils formed in neutral or calcareous, moderately fine textured and fine textured alluvium. They are in some of the old meander channels on flood plains and on some nearly level flood plains where the water table is high. The native vegetation was water-tolerant hardwoods and shrubs and some grasses.

In a representative profile, the surface layer is about 11 inches of very dark gray silty clay loam. The subsoil is about 28 inches thick. The upper 8 inches is firm, dark-gray silty clay loam; the middle 7 inches is very firm, dark-gray light silty clay, and the lower 13 inches is very firm, gray silty clay. The underlying material, at a depth of about 39 inches, consists of sand and gravel and layers of silt and clay.

The Saranac soils are slowly permeable and have a high available moisture capacity. The surface layer is naturally neutral, and the soils are naturally high in organic-matter content. The main limitation is excessive wetness. These soils are subject to flooding during winter and early in spring and to occasional flooding during the growing season. They are used mainly for crops, but some narrow, undrained, cutoff old stream meanders are wooded. Some areas of old meanders have water ponded on them for long periods following flooding or rains.

Representative profile of Saranac silty clay loam, in a cultivated field 200 feet east of the bridge across Brandywine Creek and 30 feet south of the road in the NW¼SE¼ sec. 29, T 14 N., R. 7 E.

Ap—0 to 7 inches, very dark gray (10YR 3/1) silty clay loam; weak, fine, granular structure; firm when moist; abundant roots; neutral; abrupt, smooth boundary.

A12—7 to 11 inches, very dark gray (10YR 3/1) silty clay loam; few, fine, faint, dark yellowish-brown (10YR 3/4) mottles; moderate, fine, subangular blocky structure; firm when moist; very dark gray (N 3/0) organic films on some faces of peds; abundant roots; neutral; clear, smooth boundary.

B21g—11 to 19 inches, dark-gray (10YR 4/1) silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/4) and dark grayish-brown (2.5Y 4/2) mottles; moderate, medium, subangular blocky structure and some angular blocky; firm when moist; neutral; clear, smooth boundary.

B22g—19 to 26 inches, dark-gray (N 4/0) light silty clay; common, medium, distinct, yellowish-brown (10YR 5/4) and dark grayish-brown (2.5Y 4/2) mottles; moderate, medium, angular blocky structure; very firm when moist; neutral; clear, smooth boundary.

B23g—26 to 39 inches, gray (N 5/0) light silty clay; common, medium, distinct, dark grayish-brown (2.5Y 4/2) and yellowish-brown (10YR 5/4) mottles; weak, coarse, subangular blocky structure; very firm when moist; calcareous; mildly alkaline; clear, smooth boundary.

Cg—39 to 50 inches, gray (10YR 5/1), stratified sand and gravel and some layers of silt and clay; moderately alkaline; calcareous.

The solum ranges from 30 to 50 inches in thickness. The Ap horizon is very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), or very dark brown (10YR 2/2). The A12 horizon is very dark gray (10YR 3/1) or black (10YR 2/1). Total thickness of the A horizon is 10 to 18 inches. The B horizon is dark gray (10YR 4/1 and N 4/0), gray (10YR 5/1 and N 5/0), or grayish brown (2.5Y 5/2 and 10YR 5/2). The B horizon is stratified, and the texture is silty clay loam, silty clay, clay loam, and clay. The C horizon is stratified, and the layers are silty clay loam, silt, sand, gravel, silty clay, or clay.

Saranac, Westland, Rensselaer, and Brookston soils have similar drainage. The Saranac soils have a finer textured subsoil than Westland, Rensselaer, and Brookston soils. Saranac soils have a lower percentage of pebbles throughout the profile than Westland soils, which are underlain by loose gravel and sand. They have a lower percentage of sand throughout the profile than Rensselaer soils, which are underlain by stratified sand and silt. The very poorly drained Saranac soils are associated on the landscape with the somewhat poorly drained Shoals soils, the moderately well drained Medway and Eel soils, and the well-drained Ross and Genesee soils.

Saranac silty clay loam (0 to 2 percent slopes) (Sa).—This nearly level, very poorly drained soil is in some of the old stream meanders and on some flood plains that have a high water table.

Included in mapping are small areas of soils that have a silt loam surface layer. Some of the soils in the old stream meanders have snail shells in the profile and are calcareous throughout. In some areas there are pebbles in the profile. Also included are small areas of Shoals soils.

Runoff is slow or very slow, and the water table is commonly near the surface. This soil is subject to flooding in winter and early in spring and to occasional flooding during some growing seasons.

If properly managed and adequately drained, this soil is suited to annual row crops common in the county. In places it is difficult to establish suitable outlets for drainage systems. Fall-seeded small grains are likely to be damaged by winter and spring flooding unless the area is protected. (Capability unit IIIw–9)

Sebewa Series

The Sebewa series consists of very poorly drained soils that are moderately deep over stratified gravel and sand. These soils formed in loamy outwash material, and depth to the underlying gravel and sand ranges from 24 to 42 inches. They are in low depressions on the outwash plains and stream terraces. The native vegetation was water-tolerant hardwoods and shrubs and some sedges and grasses.

In a representative profile, the surface layer is about 15 inches of clay loam. The upper part is very dark brown, and the lower part is very dark gray. The subsoil is about 14 inches of firm, dark-gray, gravelly clay loam mottled with olive brown and yellowish brown. The underlying material is at a depth of about 32 inches and consists of calcareous stratified gravel and sand and some layers of silty and loamy material.

Sebewa soils are naturally high in organic-matter content. The surface layer is naturally slightly acid or neutral. These soils have a high available moisture capacity. They are moderately permeable in the subsoil and rapidly permeable in the underlying material. The water table is at or near the surface for long periods of time. These soils are used mainly for crops, but some undrained areas are in permanent pasture or woodland.

Representative of Sebewa clay loam, in a cultivated field 990 feet west and 550 feet north of the southeast corner of the SW¼ sec. 15, T. 13 N., R. 6 E.

Ap—0 to 10 inches, very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) when dry; moderate, medium, granular structure; firm when moist; few ½- to 1-inch pebbles; abundant roots; neutral; abrupt, smooth boundary.

A12tg—10 to 15 inches, very dark gray (10YR 3/1) clay loam; few, fine, faint, dark-brown (7.5YR 4/4) mottles; weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm when moist; few ½- to 1-inch pebbles; neutral; clear, smooth boundary.

B21tg—15 to 22 inches, dark-gray (N 4/0) gravelly clay loam; common, fine, distinct, olive-brown (2.5Y 4/4) mottles; weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm when moist; dark-gray (10YR 4/1) clay films continuous on faces of peds and coatings on pebbles; neutral; clear, smooth boundary.

B22tg—22 to 32 inches, dark-gray (N 4/0) light gravelly clay loam; many, medium, distinct, yellowish-brown (10YR 5/6 and 5/8) and olive-brown (2.5Y 4/4) mottles; weak, coarse, subangular blocky structure; firm when moist; dark-gray (10YR 4/0) clay films continuous on faces of peds and on pebbles; decomposing limestone pebbles; moderately alkaline; calcareous; clear, wavy boundary.

C—32 to 60 inches, gray (10YR 5/1) stratified gravel and sand and some layers of silty and loamy material; calcareous; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. The Ap horizon is very dark brown (10YR 2/2), black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2 and 2.5Y 3/2). The A horizon ranges from 10 to 15 inches in total thickness. The B2 horizon is clay loam, gravelly clay loam, or heavy gravelly loam. Color is dark gray (10YR 4/1 and N 4/0), grayish brown (10YR 5/2 and 2.5Y 5/2), or gray (N 5/0 and 10YR 5/1).

Sebewa, Westland, and Rensselaer soils occupy similar terrain and are similar in natural drainage. Sebewa soils have a thinner solum than Westland soils, which are underlain by loose gravel and sand at a depth of 42 to 60 inches. They have more pebbles and a thinner solum than Rensselaer soils, which are underlain by sand and silt at a depth of 42 to 60 inches.

Sebewa clay loam (0 to 2 percent slopes) (Se).—This nearly level, very poorly drained soil is in low depressions and in old stream meanders on terraces. This soil is in irregularly shaped areas which range in size from 3 to more than 100 acres.

Included in mapping are small areas of a soil that has a loam surface layer. In some included areas the soil is calcareous throughout. A few small areas of Westland soils are also included.

Wetness is the main limitation. Runoff is slow to very slow. Some low-lying areas are flooded during winter and early in spring. Water ponds in some areas during wet weather. If adequately drained and properly managed, this soil is suited to annual row crops common in the county. Fall-seeded small grains are likely to be damaged by ponding of surface water or by winter and spring flooding. If worked when too wet, this soil is subject to puddling and becomes hard and cloddy upon drying. Drainage systems which remove water from the surface layer and upper part of the subsoil permit the growing of cultivated crops and prevent the underlying gravel from drying out. In some areas it is difficult to establish adequate outlets for drainage systems. (Capability unit IIw–4)

Shoals Series

The Shoals series consists of deep, somewhat poorly drained soils. These soils formed in neutral or mildly alkaline alluvium. They are in old stream meanders and in low-lying areas on the flood plains of the major streams and their tributaries.

In a representative profile, the surface layer is about 10 inches of dark grayish-brown silt loam. The subsoil is about 32 inches of friable, dark grayish-brown silt loam mottled with yellowish brown and grayish brown. The underlying material is calcareous, grayish-brown, stratified silt loam, silty clay loam, loam, and fine sand.

Permeability is moderate. These soils have a high available moisture capacity. They have moderate organic-matter content and are neutral or mildly alkaline. The main limitation is excessive wetness. These soils are subject to flooding during winter and early in spring and to occasional flooding during some growing seasons.

These soils are used mainly for crops, but areas cut up by meandering streams and old undrained stream meanders are used for pasture or woodland.

Representative profile of Shoals silt loam, in a cultivated field 10 feet north and 1,066 feet west of the southeast corner of the SW¼ sec. 5, T. 11 N., R. 6 E.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; few

very dark grayish-brown (10YR 3/2) worm casts; few 1- to 3-millimeter wormholes; few roots; neutral; abrupt, smooth boundary.

B21—10 to 24 inches, dark grayish-brown (10YR 4/2) silt loam; common, fine, distinct, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles; moderate, medium, granular structure; friable; very dark grayish-brown (10YR 3/2), organic coatings on some faces of peds; few 2- to 5-millimeter wormholes and voids; very dark grayish-brown worm casts; few roots; neutral; clear, smooth boundary.

B22—24 to 40 inches, dark grayish-brown (10YR 4/2) silt loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; friable; few coatings on ped faces; neutral; clear, wavy boundary.

C—40 to 60 inches, grayish-brown (10YR 5/2) stratified silt loam, silty clay loam, loam, and fine sand; massive; friable when moist; calcareous; moderately alkaline.

The solum ranges from 24 to 40 inches thick. The Ap horizon is grayish brown (10YR 5/2) or dark grayish brown (10YR 4/2). In uncultivated areas there is a 2- to 5-inch, very dark grayish-brown (10YR 3/2) A1 horizon. The subsoil is loam, light clay loam, silt loam, or silty clay loam. The Ap, B21, and B22 horizons contain enough sand to feel gritty. Depth to mottles is 12 to 18 inches.

Shoals soils are on similar terrain and formed in similar material as Eel and Medway soils. Shoals soils are mottled at a shallower depth than Eel soils. They are lighter colored and are mottled at a shallower depth than Medway soils. The somewhat poorly drained Shoals soils are closely associated on the landscape with the very poorly drained Saranac soils, the moderately well drained Eel soils, and the well-drained Genesee soils.

Shoals silt loam (0 to 2 percent slopes) (Sh).—This nearly level, somewhat poorly drained soil is on low-lying flood plains along the major streams and their tributaries. It is in the narrow bottoms (fig. 14) extending into the uplands.

Included in mapping are small areas of Eel and Genesee soils near the streams. In some small, low areas very poorly drained Saranac soils are also included. Some soils that have a fine sandy loam and loam surface layer are included. In a few included areas along Conns Creek, limestone bedrock is at a depth of 20 to 42 inches.

Runoff is slow or very slow. Excessive wetness and flooding are the main limitations to the use and management of this soil. In some places it is difficult to establish suitable outlets for drainage systems. If adequately drained and properly managed, this soil is suited to all row crops common in the county. The main crops are corn and soybeans. Fall-seeded small grains are likely to be damaged by winter or spring overflow unless the area is protected from flooding. (Capability unit IIw-7)

Sleeth Series

The Sleeth series consists of deep, nearly level, somewhat poorly drained soils. These soils formed in loamy

Figure 14.—Narrow alluvial bottom of Shoals silt loam that is used for pasture.

material and overlie stratified sand and gravel. Depth to the loose, calcareous sand and gravel is 40 to 60 inches. These soils are on the outwash plains and stream terraces. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 8 inches of dark grayish-brown loam underlain by 3 inches of grayish-brown loam mottled with yellowish brown and strong brown. The subsoil is about 37 inches thick. The uppermost 6 inches is friable, brown clay loam mottled with grayish brown, strong brown, and pale brown; the next 15 inches is firm, grayish-brown or dark-gray clay loam mottled with yellowish brown, strong brown, grayish brown, and olive brown; the next 6 inches is firm, dark-gray gravelly clay loam mottled with yellowish brown and brown; and the lower 10 inches is moderately alkaline, friable, grayish-brown gravelly clay loam mottled with yellowish brown. The underlying material is at a depth of 48 inches and consists of calcareous, stratified, loose sand and gravel.

Permeability is moderate, and the available moisture capacity is high. The surface layer is medium acid unless it has been limed. These soils are naturally low in organic-matter content. During winter and early in spring the water table is commonly near the surface. These soils are mainly used for crops.

Representative profile of Sleeth loam, in a cultivated field 245 feet south and 80 feet east of the northwest corner of the NE¼NW¼ sec. 28, T. 14 N., R. 7 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A2—8 to 11 inches, grayish-brown (10YR 5/2) loam; common, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; weak, medium, granular structure; friable when moist; neutral; clear, smooth boundary.

B1—11 to 17 inches, brown (10YR 5/3) light clay loam; common, medium, distinct, grayish-brown (10YR 5/2), strong-brown (7.5YR 5/6), and pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure; friable when moist; slightly acid; clear, smooth boundary.

B21tg—17 to 23 inches, grayish-brown (10YR 5/2) clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) and olive-brown (2.5Y 4/4) mottles; weak, coarse, prismatic structure breaking to moderate, medium, subangular and angular blocky; firm when moist; thin dark-gray (10YR 4/1) clay films continuous on most faces of peds; medium acid; clear, wavy boundary.

B22tg—23 to 32 inches, dark-gray (10YR 4/1) clay loam; common, medium, distinct, yellowish-brown (10YR 5/6), strong-brown (7.5YR 5/6), and grayish-brown (10YR 5/2) mottles; weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm when moist; about 10 percent fine gravel; thin dark-gray (10YR 4/1) clay films continuous on all faces of peds and on pebbles; medium acid; clear, wavy boundary.

B23tg—32 to 38 inches, dark-gray (10YR 4/1) gravelly clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) and brown (10YR 4/3) mottles; moderate, medium to coarse, subangular blocky structure; dark-gray (10YR 4/1) clay films continuous on faces of peds and on pebbles; firm when moist; neutral; gradual, wavy boundary.

B3—38 to 48 inches, grayish-brown (10YR 5/2) gravelly clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium to coarse, subangular blocky structure; friable when moist; very dark gray (10YR 3/1) clay films on gravel faces and on some peds; few decomposing dolomitic rocks; calcareous; moderately alkaline; abrupt, wavy boundary.

IIC—48 to 55 inches, grayish-brown (10YR 5/2) gravel and sand; single grain; loose; calcareous; moderately alkaline.

The solum ranges from 40 to 60 inches thick. The Ap horizon is dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), or light brownish gray (10YR 6/2). The A2 horizon is light brownish gray (10YR 6/2) or grayish brown (10YR 5/2). The A2 horizon is lacking in some areas. The B2 horizon is silty clay loam, clay loam, or gravelly clay loam. The B2 horizon is mainly dark gray (10YR 4/1), dark grayish brown (10YR 4/2 and 2.5Y 4/2), grayish brown (10YR 5/2 and 2.5Y 5/2), or brown (10YR 5/3). The moderately alkaline B3 horizon is at a depth ranging from 34 to 44 inches. It is 8 to 18 inches thick.

Sleeth, Crosby, Whitaker, and Ayrshire soils are similar in drainage characteristics and are on similar terrain. Sleeth soils have more gravel in the lower part of the subsoil than Crosby soils, which are underlain by loam till. They have more gravel in the solum than Whitaker soils, which are underlain by stratified silt and sand and which lack calcareous gravelly clay loam in the lower part of the subsoil. Sleeth soils are not so sandy as Ayrshire soils, which contain no gravel and which are underlain by fine sand and silt. The somewhat poorly drained Sleeth soils are closely associated with the well-drained Ockley and Fox soils and the very poorly drained Westland soils.

Sleeth loam (0 to 2 percent slopes) (Sm).—This nearly level, somewhat poorly drained soil is on outwash and stream terraces and is underlain by stratified sand and gravel.

Included in mapping are small areas of Westland soils in the narrow, elongated depressions. In a few places there are small areas of soils included which are mottled at a depth of 18 to 30 inches. Also included are a few small areas of Ockley soils. In places there are small pockets of loose gravel at a depth of less than 42 inches.

Runoff is slow. The water table is near the surface early in spring. Wetness is the main limitation. If adequately drained and properly managed, this soil is suited to all crops common in the county. The main crops are corn and soybeans. (Capability unit IIw-2)

Westland Series

The Westland series consists of deep, very poorly drained soils. These soils formed in loamy outwash material and are underlain by loose sand and gravel at a depth to 42 to 60 inches. They are in slightly depressed swales on the outwash plains and stream terraces. The native vegetation was water-tolerant hardwoods and shrubs and some sedges and grasses.

In a representative profile, the surface layer is about 13 inches of clay loam. The upper part is very dark gray, and the lower part is black. The subsoil is about 32 inches thick. The upper 13 inches is firm, dark-gray clay loam mottled with olive brown and yellowish brown; the middle 14 inches is firm, gray clay loam mottled with olive brown and yellowish brown; the lower part is firm, gray gravelly clay loam mottled with yellowish brown. The underlying material is light brownish-gray and gray, loose, stratified gravel and sand.

Westland soils are naturally high in organic-matter content. The surface layer is naturally slightly acid or neutral, and lime is generally not needed. These soils have a high available moisture capacity and slow permeability. The main limitation to use and management of

these soils is excessive wetness. The water table is near the surface during wet weather. Surface water ponds following periods of high rainfall. Most areas are used for crops, but a few small areas are wooded.

Representative profile of Westland clay loam, in a cultivated field 240 feet east and 160 feet north of the southwest corner of sec. 11, T. 13 N., R. 5 E.

Ap—0 to 7 inches, very dark gray (10YR 3/1) clay loam; weak, medium, granular structure; firm when moist; several wormholes and worm casts; a few 1/4- to 3/4-inch pebbles; neutral; abrupt, smooth boundary.

A12—7 to 13 inches, black (10YR 2/1) clay loam; moderate, medium, subangular blocky structure; firm when moist; shiny films on faces of peds; a few 1/4- to 3/4-inch pebbles; few wormholes and worm casts; neutral; clear, smooth boundary.

B21tg—13 to 26 inches, dark-gray (N 4/0) clay loam; many, medium, distinct, olive-brown (2.5Y 4/4) and yellowish-brown (10YR 5/6) mottles; weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm when moist; dark-gray (10YR 4/1) clay films continuous on faces of peds; few very dark gray (10YR 3/1) worm casts; a few wormholes; a few 1/4- to 1/2-inch pebbles; neutral; clear, smooth boundary.

B22tg—26 to 40 inches, gray (10YR 5/1) clay loam; many, medium, distinct, olive-brown (2.5YR 4/4) and yellowish-brown (10YR 5/6 and 5/8) mottles; weak, coarse, prismatic structure breaking to moderate, coarse, subangular blocky; firm when moist; dark-gray (N 4/0) clay films continuous on faces of peds and on pebbles; few root holes and wormholes; neutral; clear, smooth boundary.

B3g—40 to 45 inches, gray (10YR 5/1) gravelly clay loam; many, medium, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; weak, coarse, subangular blocky structure; firm when moist; neutral to mildly alkaline; abrupt, wavy boundary.

IIC—45 to 55 inches, light brownish-gray (10YR 6/2) and gray (10YR 5/1), loose, stratified gravel and sand; calcareous; moderately alkaline.

The solum ranges from 42 to 60 inches in thickness. The A horizon is very dark brown (10YR 2/2), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2) and 12 to 18 inches thick. There is a dark-gray (10YR 4/1) clay loam B1 horizon in some areas. The B2 horizon is clay loam or gravelly clay loam. The B2 horizon is mainly gray (10YR 5/1 and N 5/0), dark gray (N 4/0 and 10YR 4/1), or grayish brown (10YR 5/2 and 2.5Y 5/2). In some areas the B3 horizon is lacking.

Westland soils are similar in drainage characteristics to Brookston, Rensselaer, and Sebewa soils and occupy similar terrain. Westland soils contain more pebbles than Brookston and Rensselaer soils and are thicker than Sebewa soils. The very poorly drained Westland soils are closely associated on the landscape with the somewhat poorly drained Sleeth soils and the well-drained Fox and Ockley soils.

Westland clay loam (0 to 2 percent slopes) (Wc).—This nearly level, very poorly drained soil is in broad depressions and narrow, elongated remnants of old stream channels on the outwash plains and stream terraces. It has the profile described as representative for the series. The soil areas are irregularly shaped and range in size from 3 to more than 160 acres.

Included in mapping are some small areas of soils that have a loam surface layer and a few small areas of soils that have loose sand and gravel at a depth of less than 42 inches. In some areas there is a calcareous gravelly loam horizon at a depth of about 30 inches, and this horizon is underlain by loose gravel and sand at a depth of about 48 inches. Also included are a few small areas of soils that have a dark-colored surface layer about 20 to 22 inches thick. Included are a few small areas of Westland soils that have lighter colored alluvium deposited on the surface.

Wetness is the main limitation. Runoff is slow or very slow. Surface water ponds in some areas during seasons of high rainfall. If properly managed and adequately drained, this soil is suited to all crops common in the county. If worked when too wet, this soil is subject to puddling and becomes hard and cloddy upon drying. Corn and soybeans are the main crops. (Capability unit IIw-1)

Westland and Brookston loams, overwash (0 to 2 percent slopes) (We).—These nearly level soils are in depressions on uplands and terraces. They consist of 10 to 20 inches of lighter colored loamy alluvium deposited over dark-colored, very poorly drained Westland and Brookston soils (fig. 15). The dominant thickness of the recently deposited alluvium is 15 to 18 inches.

On the terraces these soils generally adjoin areas of Westland soils. In these areas the underlying very poorly drained, dark-colored soil has a profile similar to that described as representative for the Westland series. On the uplands these soils generally adjoin areas of Brookston soils. In these areas the underlying very poorly drained, dark-colored soil has a profile similar to that described as representative for the Brookston series.

Included in mapping are small areas of soils in which the underlying soil has a profile similar to that described as representative of the Rensselaer series. A few areas of soils that contain light-colored alluvium deposits more than 20 inches thick are also included.

Figure 15.—Profile of Westland and Brookston loams, overwash, shows 18 inches of light-colored alluvium over darker Brookston soil.

These soils have a high available moisture capacity and moderately slow permeability. The main limitation to the use and management of these soils in excessive wetness. If adequately drained and properly managed, these soils are suited to all crops common in the county. (Capability unit IIw-1)

Whitaker Series

The Whitaker series consists of deep, nearly level, somewhat poorly drained soils. These soils formed in stratified sand and silt and are calcareous at a depth of 42 to 60 inches. They are on the outwash and stream terraces. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 11 inches of brown loam. The subsurface layer is about 3 inches of grayish-brown loam mottled with yellowish brown. The subsoil is about 34 inches thick and is in three main parts. The upper 5 inches is friable, brown loam mottled with grayish brown and yellowish brown; the middle 19 inches is firm, grayish-brown clay loam mottled with light brownish gray, dark brown, and yellowish brown. The lower 10 inches is firm, dark yellowish-brown sandy clay loam mottled with grayish brown and brown. The underlying material is at a depth of about 48 inches and consists of stratified sand, silt, and a minor amount of silty clay loam and fine gravel.

These soils are moderately permeable and have a high available moisture capacity. They are naturally low in organic-matter content. The surface layer is medium acid unless it has been limed. During winter and early in spring the water table is generally near the surface. These soils are used mainly for crops.

Representative profile of Whitaker loam, in a cultivated field 492 feet north and 1,576 feet east of the southwest corner of sec. 2, T. 13 N., R. 5 E.

Ap—0 to 11 inches, brown (10YR 4/3) loam; moderate, medium and fine, granular structure; friable when moist; slightly acid; abrupt, smooth boundary.

A2—11 to 14 inches, grayish-brown (10YR 5/2) loam; common, fine, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; weak, thick, platy structure; friable when moist; many wormholes, 2 to 5 millimeters in diameter; some brown (10YR 4/3) worm casts; strongly acid; clear, smooth boundary.

B1—14 to 19 inches, brown (10YR 5/3) loam; common, medium, faint, grayish-brown (10YR 5/2) mottles and some yellowish-brown (10YR 5/6 and 5/8) mottles; weak, medium, subangular blocky structure; friable when moist; thin, patchy, dark clay films on faces of peds; strongly acid; clear, wavy boundary.

B21t—19 to 30 inches, grayish-brown (10YR 5/2) clay loam; many, medium, distinct, yellowish-brown (10YR 5/4) and light brownish-gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure; firm when moist; sand fills in vertical cracks; dark grayish-brown (10YR 4/2) clay films continuous on faces of peds; strongly acid; clear, smooth boundary.

B22t—30 to 38 inches, grayish-brown (10YR 5/2) clay loam to sandy clay loam; many, medium, distinct, yellowish-brown (10YR 5/4) mottles and a few dark-brown (7.5YR 4/4) mottles; moderate, medium and coarse, subangular blocky structure; firm when moist; grayish-brown (10YR 5/2) clay films continuous on faces of peds; strongly acid; clear, smooth boundary.

B3t—38 to 48 inches, dark yellowish-brown (10YR 4/4) sandy clay loam; many, medium, distinct, grayish-brown (10YR 5/2) and brown (7.5YR 4/4) mottles; weak, coarse, subangular blocky structure; firm when moist; neutral; clear, smooth boundary.

C—48 to 72 inches, stratified sand and silt and some thin layers of silty clay loam and fine gravel; calcareous; moderately alkaline.

The solum ranges from 42 to 60 inches in thickness but is typically 42 to 50 inches thick. The Ap horizon is brown (10YR 5/3), dark grayish brown (10YR 4/2), or grayish brown (10YR 5/2). The A2 horizon is lacking in some areas where there has been deep plowing. The B1 horizon is also lacking in some areas. The B2 horizon is mainly grayish brown (10YR 5/2), brown (10YR 5/3), yellowish brown (10YR 5/4), or dark grayish brown (10YR 4/2). The B2 horizon is clay loam, sandy clay loam, or silty clay loam that is more than 15 percent sand. The C horizon ranges from loose, stratified sand that contains minor amounts of silt to stratified silt that contains lenses of sand.

Whitaker soils are similar in natural drainage characteristics to Crosby, Ayrshire, and Sleeth soils and are on similar terrain. Whitaker soils have a coarser textured subsoil than Crosby soils, which formed in loam till. They have a finer textured subsoil than Ayrshire soils, which formed in fine sand and silt. Whitaker soils contain less gravel in the solum than Sleeth soils, which have a moderately alkaline, gravelly clay loam B3 horizon and are underlain by stratified loose gravel and sand. The somewhat poorly drained Whitaker soils are associated on the landscape with the well-drained Martinsville soils and the very poorly drained Rensselaer soils.

Whitaker loam (0 to 2 percent slopes) (Wh).—This nearly level, somewhat poorly drained soil is on outwash terraces that are underlain by sand and silt. This soil is irregularly shaped and ranges in size from 3 to more than 40 acres.

Included in mapping are areas of soils that have a silt loam surface layer and a few small areas of soils that have a fine sandy loam surface layer. In a few places there is till below a depth of 5 or 6 feet. Also included are a few small areas of Rensselaer soils in narrow, elongated old channels. A few small areas of moderately well drained soils that are mottled at a depth of 18 to 30 inches are also included. A few small areas of well-drained soils are included on slightly higher, moderately sloping ridges.

Runoff is slow. The water table is near the surface early in spring. Wetness is the main limitation. If properly managed and adequately drained, this soil is suited to all crops common in the county. The main crops are corn and soybeans. (Capability unit IIw-2)

Use and Management of the Soils

This section contains information about the use and general management of soils for crops, wildlife, recreation, and engineering. It includes a subsection on predicted yields of the major crops grown under two levels of management.

Use of the Soils for Crops

Differences among soils in such properties as slope, texture, depth to bedrock, fertility, droughtiness, and wetness result in differences in the suitability for crops and management needs. Each farm has its own pattern of soils, and therefore has its own management problems. Some of the principles of farm management are general enough to apply to the soils of all farms. Other management procedures, however, apply only to specific soils and to certain crops.

Lime and fertilizer.—This survey only gives general information on the need for lime and fertilizer. The specific rate of application should be based on soil tests and on recommendations of the Soil Conservation Service and the Purdue University Agricultural Experiment Station. The amount of fertilizer and lime needed depends upon the results of the soil tests, the crop to be grown, the past cropping history, the level of yield desired, and the soil type.

Samples sent in for laboratory testing should consist of a single soil type. The soil map is a good guide for locating areas where samples can be taken. The district conservationist or the county extension agent can supply detailed instruction on soil sampling.

Irrigation.—Irrigation is practical on well-drained soils where crop yields are retarded by shortage of moisture. The source of irrigation water and proximity to the soil often determine if irrigation is practical. Such specialty crops as vegetables and berries are usually irrigated.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or engineering.

In the capability system, all kinds of soil are grouped at three levels, the capability class, the subclass, and the unit. These levels are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrow choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat. (None of the soils in this county are in Class V.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, water supply, or esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used only in some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, although they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIw-5. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units in Shelby County are described and suggestions for the use and management of the soils are given. The soil series represented in each capability unit are listed, but this does not mean that all the soils of a named series are in the unit. To find the capability classification of any given soil, refer to the "Guide to Mapping Units." The capability units are not consecutive, because not all units used in Indiana are in this county.

Because only about 5.5 percent of the county is used for woodland, the soils are not classified by woodland suitability groups. A brief paragraph at the end of each capability unit covers use of the soils for woodland.

CAPABILITY UNIT I-1

This unit consists of deep, well-drained, medium-textured, nearly level soils of the Martinsville and Ockley series. These soils are on terraces along the major streams.

The organic-matter content of these soils is medium or low, and natural fertility is moderate. Permeability is moderate, and the available moisture capacity is high. Runoff is slow, and the erosion hazard is none to slight. The main management needs are maintenance of organic-matter content and of fertility.

These soils are well suited to all crops commonly grown in the county. They can be cropped intensively to corn or soybeans. Wheat, legumes, and grasses do well. These soils are suited to such special field crops as tomatoes, potatoes, and green beans. They are well suited to irrigated crops.

Crop residue, winter cover crops, and green-manure crops can be used to help maintain a desirable level of organic matter. Lime needs to be added periodically to maintain a favorable reaction for crops commonly grown.

These soils are suited to woodland. They are ideally suited to deep-rooted trees, such as black walnut, but tulip-poplar, upland oaks, and black locust are also grown on these soils.

CAPABILITY UNIT I-2

This unit consists of deep, nearly level, well drained and moderately well drained, medium-textured soils of the Eel, Genesee, Medway, and Ross series. These soils are on flood plains along major streams and their tributaries.

Permeability is moderate, the available water capacity is high, and content of organic matter is moderate to high. The soils in this unit are neutral or mildly alkaline in the plow layer. These soils are naturally high in fertility and easy to cultivate. They are subject to occasional flooding in winter or early in spring. There is no erosion other than occasional stream scouring. Management requirements are maintenance of desirable organic-matter content and fertility level.

These soils are well suited to cash-grain crops, such as corn and soybeans. Unless the area is protected from flooding or is seldom flooded, small grains and most legumes are subject to damage. Grasses, such as tall fescue, that can tolerate periods of flooding are suited.

Crops grown on these soils respond well to applications of fertilizer, but lime is generally not needed. Use of crop residue and cover crops helps to maintain a favorable level of organic-matter content and to protect the soil during the winter months. In places a close-growing grass, such as tall fescue, is needed in overflow channels and on bare streambanks that are subject to scouring.

These soils are suited to woodland and are well suited to deep-rooted trees, such as black walnut. Other major species grown on these soils are tulip-poplar and slippery elm.

CAPABILITY UNIT IIe-1

This unit consists of deep, well drained and moderately well drained, medium-textured, gently sloping soils of the Crosby, Martinsville, Miami, and Parke series. These soils are on low knolls, ridges, and breaks along drainageways.

These moderately permeable and moderately slowly permeable soils have a high available moisture capacity. Natural fertility is moderate, and organic-matter content is moderately low or low. The plow layer is medium acid or strongly acid unless it has been limed. Runoff is slow or medium. The main management needs are control of erosion, maintenance of fertility, and improvement of organic-matter content and tilth.

These soils are suited to all crops grown locally. Corn, soybeans, wheat, alfalfa, red clover, and grass are the main crops.

Crop residue, winter cover crops, and an occasional grass-legume crop can be used to help improve and maintain organic-matter content, maintain good tilth, and control erosion. Minimum tillage, contour cultivation, diversion terraces, and rotations that include grasses can be used to help control erosion. Several combinations of cropping systems are suited to these soils. Grassed waterways are needed in some draws where runoff water concentrates. Lime applications are needed periodically to maintain a favorable soil reaction for crops commonly grown.

These soils are suited to woodland. They are ideally suited to deep-rooted trees, such as black walnut. Other main trees are tulip-poplar, upland oaks, and black cherry.

CAPABILITY UNIT IIe-9

This unit consists of moderately deep, well drained and moderately well drained, gently sloping soils of the Fox and Nineveh series. These soils are underlain by loose sand and gravel at a depth of 24 to 40 inches. They are on the terraces along the major streams.

The soils in this unit have moderate fertility, are easy to cultivate, and respond well to good management. Permeability is moderate in the subsoil and very rapid in the underlying material. Organic-matter content is moderate or low. The surface layer is naturally medium acid to neutral. The available moisture capacity is low to moderate. During long dry seasons the soils are droughty. Runoff is slow. The main management needs are control of erosion and maintenance of organic-matter content.

These soils are suited to all crops commonly grown in the county. Corn, soybeans, grain sorghum, small grains, and alfalfa mixtures are the main crops.

Crop residue, winter cover crops, and spring plowing can be used to help control erosion and maintain a desirable organic-matter content. Several combinations of cropping systems are suitable. These soils are well suited to irrigated crops. If irrigated, they are suited to special crops, such as strawberries, potatoes, and tomatoes.

These soils are suited to woodland. The main trees are upland oaks, black walnut, and sugar maple.

CAPABILITY UNIT IIe-11

This unit consists of Princeton fine sandy loam, 2 to 6 percent slopes. This deep, well-drained soil is on ridges of windblown sand.

Fertility is moderate. This soil has low organic-matter content and is easy to cultivate. It has a moderate to high available water capacity and moderate permeability. This soil is droughty during extremely long dry seasons. It is naturally medium acid. Runoff is slow. Erosion and runoff are the main hazards in the use and management of this soil. Organic-matter content and fertility need to be maintained.

This soil is suited to all crops commonly grown in the county. Corn, soybeans, small grains, and legume-grass mixtures are the suitable crops. It is suited to melons and other specialty crops.

Winter cover crops and crop residue can be used to help maintain fertility and organic-matter content. These practices, along with the use of grassed waterways and

minimum tillage, help to control erosion and runoff. Without mechanical controls, fewer years of row crops and more years of close-growing crops are needed to protect the soil. Several combinations of cropping systems are suited to this soil.

This soil is suited to woodland and is ideally suited to such deep-rooted trees as black walnut. Other major trees are tulip-poplar, wild cherry, and red oak.

CAPABILITY UNIT IIe-12

This unit consists of deep, somewhat poorly drained and well-drained, medium-textured, gently sloping soils of the Crosby and Miami series. These soils are on uplands.

Fertility is medium. These soils have low organic-matter content and are easy to cultivate. The available moisture capacity is high, and permeability is slow. Runoff is slow.

Erosion is a hazard, and wetness is a limitation to farming. The maintenance of organic-matter content and fertility is needed in the use and management of these soils for crops.

Crop residue, winter cover crops, green-manure crops, and minimum tillage can be used to help control erosion and maintain desirable organic-matter content and good soil tilth. Water control is needed for maximum efficiency in the use and management of these soils for crops (fig. 16).

If water is adequately controlled, these soils are well suited to all crops commonly grown in the county. The main crops are corn and soybeans. Small grains, grass-legume mixtures for hay and pasture, and tomatoes are also grown.

These soils are suited to woodland. Trees that are somewhat water tolerant are better suited than others. The main trees grown are upland oaks, tulip-poplar, and beech.

Figure 16.—Spillway with drain tile outlet controls erosion on soils of capability unit IIe-12.

CAPABILITY UNIT IIw-1

This unit consists of deep, very poorly drained, nearly level soils of the Brookston, Kokomo, Rensselaer, and Westland series. These soils are in slight depressions on uplands and terraces.

Soils in this unit have moderate or high fertility and high organic-matter content. The surface layer becomes hard and cloddy upon drying if these soils are worked when wet. They have a high available water capacity and slow permeability. The surface layer is naturally slightly acid or neutral. Runoff is very slow. The water table is near the surface during winter and early in spring, and water may pond on the surface during wet weather. The main limitation to the use and management of these soils is wetness. Wetness is more severe on the Kokomo soils than it is on other soils in this unit. Maintenance of tilth and organic-matter content are management needs.

If an adequate drainage system is established and maintained, these soils are suited to all crops commonly grown in the county (fig. 17). They are suited to intensive cropping to corn and soybeans. Small grains, meadow, and such specialty crops as tomatoes are also suited.

Green-manure crops, winter cover crops, and crop residue can be used to help maintain organic-matter content. These practices, along with minimum tillage and mulch tillage, help to improve soil tilth.

These soils are suited to woodland. Water-tolerant trees, such as wetland oaks, green ash, and soft maple, are better suited than others.

CAPABILITY UNIT IIw-2

This unit consists of deep, somewhat poorly drained, medium-textured and moderately coarse textured, nearly level soils of the Ayrshire, Crosby, Sleeth, and Whitaker series. These soils are on the uplands and terraces.

The available moisture capacity is high. Permeability is moderate or slow. These soils are naturally moderate in fertility and low in organic-matter content. The plow layer is medium acid unless it has been limed. The water table is near the surface during wet seasons. Runoff is slow. Wetness is the main limitation to the use and management of these soils. Maintenance of good tilth and organic-matter content is the main management need.

These soils are suited to all crops common in the county, provided an adequate drainage system is installed and maintained (fig. 18). They are suited to corn, soybeans, small grains, legumes, and grasses and to intensive cropping to corn and soybeans.

Crop residue, winter cover crops, and minimum tillage can be used to help improve and maintain a desirable organic-matter content and soil tilth.

These soils are suited to woodland. The main trees grown are upland oaks, tulip-poplar, and beech.

CAPABILITY UNIT IIw-4

This unit consists of Sebewa clay loam, a moderately deep, very poorly drained, moderately fine textured soil. It is in slight depressions on terraces.

Fertility and organic-matter content are moderate to high. The plow layer dries out cloddy and puddled if worked when wet. It is naturally slightly acid to neutral. The available moisture capacity is high, and permeability is moderate in the subsoil. The water table is at or near the surface during winter and spring. Runoff is very slow. Wetness is the main limitation to the use and management of this soil.

If adequately drained, this soil is suited to all row crops commonly grown in the county. It is suited to corn and soybeans.

Crop residue, winter cover crops, and spring plowing can be used to help maintain good tilth. A suitable drainage system is needed for maximum efficiency in the use and management of this soil. If it is adequately drained the soil warms up earlier in spring. Careful design and installation of the drainage system is needed to lower the water table to a depth no greater than the lower part of the subsoil. If this is done a moisture supply is maintained in the lower part of the subsoil and underlying gravel, and the soil is kept from becoming droughty. Several cropping systems are suited to this soil, including year after year of row crops.

This soil is suited to woodland, especially to such water-tolerant trees as wetland oaks, soft maple, and willow.

CAPABILITY UNIT IIw-7

This unit consists of deep, somewhat poorly drained, nearly level Shoals silt loam. It is on the flood plains along major streams and in narrow bottoms.

This soil is high in natural fertility, is easy to cultivate, and responds well to good management. It is naturally slightly acid or neutral. The organic-matter content is moderately low, and the available moisture capacity is high. Permeability is moderate. Runoff is slow, and the water table is at or near the surface during winter and spring. The soil is subject to flooding during winter and early in spring. There is no erosion other than occasional stream scouring. The main management needs are lowering of the water table by drainage and maintaining good tilth.

Figure 17.—Installing drain tile in Westland clay loam to remove excess water from the root zone.

Figure 18.—Water is removed by shallow surface drains on soils of capability unit IIw-2. This system can be used in combination with the tile drainage.

The soil in this unit is suited to cash-grain crops, such as corn and soybeans. In many areas this soil occupies narrow, elongated flood plains that are dissected by the meandering stream and are not practicable for row crops. In these areas, pasture and hay are suitable. Unless protected from flooding, fall-seeded small grains are subject to damage.

Practices such as disking corn stalks, which return crop residue to the soil, help protect the soil from stream scouring during periods of flooding. Use of a fall cover crop also helps to protect the soil during winter. A suitable drainage system is needed for maximum efficiency in the use and management of this soil. In some low channels where floodwater tends to scour, a close-growing sod crop, such as tall fescue, is suitable.

The soil is suited to woodland, especially to such water-tolerant trees as pin oak, sycamore, soft maple, and cottonwood.

CAPABILITY UNIT IIw-10

This unit consists of Linwood muck, a deep, very poorly drained, organic soil. This soil is on nearly level flats and in depressions.

This soil is fertile, is easy to cultivate, and responds extremely well to good management. The organic-matter content is very high, and the available moisture capacity is high. Permeability is rapid. The main management need is drainage to lower the high water table. In places this soil is subject to flooding during winter and early in spring. Runoff is very slow or ponded.

This soil is suited to corn and soybeans. To a much lesser extent small grains are also suitable.

A suitable drainage system is needed for maximum efficiency in the use and management of this soil. Some areas are 1 to 5 acres in size. In some places it is difficult to get an adequate outlet for drainage systems. These areas are commonly farmed along with larger surrounding soil areas. The only trees to which this soil is suited are water-tolerant species, such as willows and birch.

CAPABILITY UNIT IIs-1

This unit consists of moderately deep, well-drained, nearly level soils of the Fox and Nineveh series. These soils are underlain by loose sand and gravel at a depth of 24 to 40 inches. They are on the terraces along the major streams.

The soils in this unit have moderate fertility and are easy to cultivate. They have high to low organic-matter content. Available moisture capacity is low to moderate.

Permeability is moderate in the subsoil and very rapid in the underlying material. During long dry seasons these soils are droughty. The main management need is maintenance of organic-matter content and fertility.

The soils in this unit are suited to all crops commonly grown in the county. Corn, grain sorghum, soybeans, grass and legume mixtures, small grains, and alfalfa are the main crops. These soils are suited to irrigated crops. Such crops as strawberries, potatoes, and tomatoes are grown with irrigation.

Use of crop residue and winter cover crops helps to maintain organic-matter content. Several combinations of cropping systems are suited to this soil.

These soils are suited to woodland. The main trees are upland oaks, black locust, and black walnut.

CAPABILITY UNIT IIs–5

This unit consists of deep, well-drained, moderately coarse textured Princeton fine sandy loam, 0 to 2 percent slopes. This soil is on sandy uplands. Runoff is slow.

This soil has moderate fertility, low organic-matter content, and a moderate to high available moisture capacity. The surface layer is naturally medium acid. It is somewhat droughty during extremely long dry seasons. Permeability is moderate. The main management need is maintenance of a desirable level of organic-matter content and fertility.

This soil is suited to all crops commonly grown in the county. It is well suited to fall-seeded small grains, such as wheat. Deep-rooted legumes, such as alfalfa, do well on this soil. It can be cropped intensively to corn and soybeans.

This soil can generally be worked earlier in spring and sooner following rain than the medium-textured and moderately fine textured soils. Several combinations of cropping systems are suitable. Crop residue, winter cover crops, and spring plowing can be used to help improve and maintain the organic-matter content.

This soil is suited to woodland, especially to such deep-rooted trees as black walnut. Other main trees are tulip-poplar, black locust, and red oak.

CAPABILITY UNIT IIs–6

This unit consists of Genesee sandy loam, sandy variant, and Ross loam, moderately deep variant. These soils are level, moderately deep, medium textured and moderately coarse textured, and well drained. They are on flood plains along the large major streams.

These soils are subject to flooding during winter and early in spring. The available moisture capacity is low to moderate. The organic-matter content is low or moderate. These soils are droughty during dry seasons. Runoff is slow. Flooding is the main hazard, and droughtiness is the main limitation to the use and management of this soil.

These soils are suited to crops and pasture. Crops grow moderately well during wet seasons but are severely reduced in dry seasons. Because there is a flooding hazard, the main crops are corn and soybeans. These soils are suited to irrigated crops. If these soils are protected from flooding by levees, they are well suited to fall-seeded grains. In places such close-growing grasses as tall fescue are used to protect the soils from scouring in overflow channels.

These soils are suited to woodland. They are ideally suited to such deep-rooted trees as black walnut, Osage-orange, and black locust.

CAPABILITY UNIT IIIe–1

This unit consists of deep, well-drained, medium-textured and moderately fine textured, gently sloping and sloping soils of the Miami and Parke series.

These soils have low organic-matter content and a high available moisture capacity. The moderately eroded soils have moderate fertility, and the severely eroded soils have low fertility. Permeability is moderate or moderately slow. Runoff is medium to rapid. The severely eroded soils have poor tilth, and the plow layer dries out cloddy and puddles if worked when wet. Tilth of the moderately eroded soils is good. The main management needs are control of erosion and maintenance of a desirable level of organic-matter content and fertility.

Soils in this unit are suited to crops commonly grown in the county. Corn, soybeans, small grains, and legume-grass hay are the main crops. These soils are also suited to pasture.

Crop residue, winter cover crops, and spring plowing can be used to help maintain organic-matter content and fertility and to help control erosion. Several combinations of cropping systems that help to control erosion are suitable for use on these soils. Where suitable, such mechanical practices as contour farming also help to control erosion and allow more years of row crop in a cropping system. Grassed waterways are needed in areas where runoff water concentrates.

These soils are suited to woodland. The main trees grown are upland oaks, black walnut, tulip-poplar, and black cherry.

CAPABILITY UNIT IIIe–8

This unit consists of gently sloping, moderately deep, well-drained Milton silt loam, 1 to 6 percent slopes. This soil formed in thin glacial drift over limestone bedrock. Depth to the underlying bedrock is 24 to 42 inches.

This soil has moderate fertility and low organic-matter content. The available moisture capacity is low to moderate, and permeability is moderate. The surface layer is naturally medium acid to slightly acid. Runoff is medium. The main management needs are control of erosion and maintenance of organic-matter content, tilth, and fertility. This soil is droughty during dry seasons.

This soil is suited to all crops common in the county. Fall-seeded crops, such as wheat, that need moisture early in the season but have low moisture requirements during summer, are well suited to this soil.

Many different cropping systems that help to control erosion are suited to this soil. Grass and legumes can be used in the rotation to help maintain organic-matter content and tilth. Crop residue needs to be returned to the surface. These practices, along with minimum tillage and contour plowing, help to control erosion. Slopes are usually short and irregular.

This soil is suited to woodland, and the main trees are upland oaks, Osage-orange, and black locust.

CAPABILITY UNIT IIIe–9

This unit consists of moderately deep, well-drained, gently sloping and sloping soils of the Fox series. The gently sloping soils are moderately fine textured and

severely eroded, and the sloping soils are medium textured and moderately eroded.

These soils have low fertility and organic-matter content but have a low to moderate available moisture capacity. The severely eroded soils have poor tilth, and the plow layer becomes cloddy and puddled if worked when wet. The surface layer is naturally medium acid. Runoff is medium or rapid. These soils are droughty during dry seasons. The main management requirements are control of erosion and maintenance of a desirable level of organic matter and fertility.

The soils in this unit are suited to most crops commonly grown in the county. Corn, grain sorghum, soybeans, and small grains are the main crops. These soils are suited to grasses and legumes grown for hay or pasture.

Crop residue, winter cover crops, and spring plowing can be used to help control erosion and maintain organic-matter content and fertility. These soils are suited to several combinations of conservation systems that help control erosion. Where practicable, such mechanical practices as contour farming also help to control erosion and allow more years of row crops in a cropping system. Grassed waterways are needed in areas where runoff water concentrates. Minimum tillage helps to maintain good soil tilth and to control erosion. These soils are suited to irrigated crops.

These soils are suited to woodland. The main trees are upland oaks, black locust, and black walnut.

CAPABILITY UNIT IIIe-15

This unit consists of deep, well-drained Princeton fine sandy loam, 6 to 12 percent slopes. This soil is on ridges of windblown sand.

This soil has moderate fertility, low organic-matter content, and moderate to high available moisture capacity. It is naturally medium acid. It is droughty during extended dry periods in the growing season. Runoff is medium. The main management needs are control of erosion and maintenance of a desirable level of organic matter and fertility.

This soil is suited to all crops commonly grown in the county. Pasture crops are well suited. Melons and other special crops do well on this soil.

Crop residue, winter cover crops, and spring plowing can be used to help maintain organic-matter content and control erosion. Several combinations of conservation cropping systems that help control erosion are suitable for use on this soil. Where practical, such mechanical devices as grassed waterways help to control erosion. This soil is suited to irrigated crops.

This soil is suited to woodland and is ideally suited to deep-rooted trees, such as black walnut. Other trees grown are mainly tulip-poplar and black cherry.

CAPABILITY UNIT IIIw-5

This unit consists of dark-colored, moderately deep, nearly level, very poorly drained Millsdale silty clay loam. This soil formed in thin glacial drift over limestone bedrock. Depth to the underlying bedrock is 24 to 42 inches.

This soil has high fertility and high organic-matter content. The available moisture capacity is moderate to high, and permeability is moderately slow. This soil is naturally slightly acid or neutral. The main management need is maintenance of tilth. Runoff is very slow. Water may pond on the surface during wet weather. The main limitation is excessive wetness. The surface layer becomes hard and cloddy upon drying if worked when wet.

If adequately drained, this soil is suited to all crops common in the county. Many different cropping systems, including year after year of row crops, are suitable for use on this soil.

Because this soil is shallow to bedrock, subsurface drainage systems, such as tile lines, are difficult to install. Crop residue, green-manure crops, and winter cover crops can be used to help maintain soil tilth.

This soil is suited to woodland. The main trees grown are such water-tolerant species as wetland oaks, soft maple, and green ash.

CAPABILITY UNIT IIIw-7

This unit consists of moderately deep, nearly level, somewhat poorly drained Randolph silt loam. This soil formed in thin glacial drift over limestone bedrock. Depth to the underlying bedrock is 24 to 42 inches.

This soil is naturally low in organic-matter content. It has a low to moderate available moisture capacity and moderately slow permeability. Runoff is slow to very slow. The main limitation is excessive wetness. The soil is somewhat droughty during long dry seasons.

This soil is suitable for all crops commonly grown in the county if an adequate drainage system is installed and maintained.

Subsurface drainage systems, such as tile drains, are difficult to install because this soil is shallow to bedrock. Crop residue, winter cover crops, and minimum tillage can be used to help maintain desirable organic-matter content.

This soil is suited to woodland. The main trees are upland oaks, tulip-poplar, and beech.

CAPABILITY UNIT IIIw-9

This unit consists of Saranac silty clay loam, a deep, nearly level, moderately fine textured, and very poorly drained soil. This soil is on flood plains along major streams.

This soil has high fertility and high organic-matter content. The available moisture capacity is high, and the fluctuating water table is high most of the time. Permeability is slow. Runoff is very slow or water is ponded, and permeability is moderate to moderately slow. The main management needs are drainage and maintenance of good tilth.

If adequately drained, this soil is suited to row crops, such as corn and soybeans. Because of the flooding hazard from nearby streams, fall-seeded small grains are subject to damage. This soil is suited to water-tolerant grasses and legumes seeded for pasture and hay.

Crop residue, winter cover crops, green-manure crops, and spring plowing can be used to help maintain good tilth and allow for a better air-water relationship. Diversion ditches are needed in some areas where this soil receives water from nearby slopes. In places suitable outlets for drainage systems are difficult to establish. Frequent flooding occurs from late in fall to spring.

This soil is suited to woodland. The main trees grown are water-tolerant trees, such as wetland oaks, green ash, and cottonwood.

CAPABILITY UNIT IVe-1

This unit consists of deep, well-drained, medium-textured and moderately fine textured, sloping and moderately steep soils of the Miami series. These soils are on uplands. The sloping soils are severely eroded, and the moderately steep soils are eroded.

The severely eroded soils have low fertility and organic-matter content. They have poor tilth, and the plow layer becomes cloddy and puddled if worked when too wet. The eroded soils have good tilth and moderate organic-matter content. They have a high available moisture capacity. Runoff is medium on the sloping soils and rapid on the moderately steep soils. The main management needs are control of erosion and maintenance of organic-matter content.

These soils are suited to conservation cropping systems that include small grains, grass and legume mixtures, and pasture. Such row crops as corn and soybeans can be used with limited frequency.

Crop residue, winter cover crops, and tilling the soil in spring can be used to help control erosion, maintain good tilth, and maintain organic-matter content. Where practicable, such mechanical practices as contour farming help to protect these soils from erosion and allow more intense cropping.

These soils are suited to woodland. The main trees grown are upland oaks, tulip-poplar, and sugar maple.

CAPABILITY UNIT IVe-9

This unit consists of moderately deep, well-drained, sloping and moderately steep soils of the Fox and Negley series. These soils are on terraces and kames. The sloping soils are moderately fine textured and severely eroded. The moderately steep soils are medium textured and eroded.

The sloping soils have low fertility and organic-matter content. They have a moderate to high available moisture capacity. They have poor tilth, and the plow layer tends to dry out hard and cloddy if worked when wet. The strongly sloping soils have low fertility and organic-matter content. The available moisture capacity is low. The Fox soils have moderate available moisture capacity, and Negley soils have high available moisture capacity. The main management needs are control of erosion, maintenance of good tilth, and maintenance of organic-matter content.

These soils are suited to conservation cropping systems that include use of small grains, grass and legume mixtures, and pasture. Row crops, such as corn and soybeans, can be used with limited frequency.

Crop residue, winter cover crops, and tilling the soil in spring help to control erosion and to maintain good tilth and organic-matter content. Where practicable, such mechanical practices as contour farming further help to protect these soils from erosion and allow more intense cropping.

CAPABILITY UNIT VIe-1

This unit consists of deep and moderately deep, moderately steep and steep, well-drained soils of the Miami and Negley series. These soils are on uplands and terraces. The severely eroded soils have a moderately fine textured surface layer. The steep soils formed in loam till and in outwash of Illinoian age.

Fertility and organic-matter content are low. The severely eroded soils have poor tilth, and the surface layer tends to become hard and cloddy upon drying if worked when wet. The available moisture capacity is high, and permeability is moderate and moderately slow. Runoff is rapid. All soils in this unit are subject to severe soil loss if cleared of trees or cultivated. Fertility needs to be improved in areas used for pasture.

These soils are not suited to cultivated crops. They are well suited to pasture and hay. Grass and mixtures of alfalfa and grass and clover and grass are well suited.

These soils are suited to woodland. The main trees are upland oaks, tulip-poplar, and sugar maple.

CAPABILITY UNIT VIIe-2

This unit consists of well-drained, steep and very steep Corydon and Hennepin soils. Some areas are shallow over limestone bedrock. These soils are medium textured and slightly eroded. Runoff is rapid or very rapid.

The soils in this unit have low fertility and a low to moderate available moisture capacity. The uneroded surface layer is high in organic-matter content. The main management need is control of erosion.

These soils are suited to woodland, wildlife habitat, or recreational uses. They are suited to limited pasture.

Permanent pasture helps to control erosion and to improve water infiltration. Pasture renovation and contour tillage also helps to control erosion. Such practices as these are suitable for areas where slopes are 18 to 25 percent. Applications of fertilizer generally improve the quality and yield of pasture.

These soils are suited to woodland. The Hennepin soils are suited to such trees as tulip-poplar, upland oaks, and sugar maple. The main trees on the Corydon soils are chinkapin oaks.

CAPABILITY UNIT VIIs-1

This unit consists of shallow, steep, well-drained Rodman gravelly loam, 18 to 35 percent slopes. This soil is on steep terrace breaks. The surface layer is gravelly loam. Loose gravel and sand are at a depth of less than 15 inches.

This soil has a very low available moisture capacity. Uneroded surfaces are high in organic-matter content. Permeability is moderately rapid. This soil is droughty. Runoff is rapid. Erosion is a hazard.

This soil is suited to woodland, wildlife habitat, recreational uses, and limited pasture. It is suited to early pasture but has limited use for summer pasture. Permanent vegetation is required to control erosion. Areas in timber need to be protected from grazing. The main trees grown are chinkapin oaks, Osage-orange, or other deep-rooted trees that are somewhat drought tolerant.

CAPABILITY UNIT VIIIs-2

This unit consists of Gravel pits and Quarries. These miscellaneous land types have some use for wildlife habitat but are not generally suited to the production of vegetation without major reclamation. Some of the abandoned Gravel pits and Quarries are being used for fishing, and the surrounding areas are used for recreation.

These miscellaneous land types are not suited to woodland, but some trees grow in cracks between stones and in places where there are small amounts of soil.

Predicted yields

Table 2 lists the average acre yields of the principal crops that can be expected on each soil in the county under two levels of management. In columns A are yields to be expected under the average or medium level of management, and in columns B are yields to be expected under the improved or high level of management that some farmers in the county are now practicing.

The yields are predicted averages for a period of 5 to 10 years. They are based on farm records and on interviews with farmers, members of the staff of the Purdue University Agricultural Experiment Station, and others familiar with the farming of the county, as well as on direct observation by soil scientists and district conservationists. Considered in making the estimates were the prevailing climate, characteristics of the soils, and the influence of different kinds of management on the soils.

It should be understood that these yield figures may not apply directly to specific tracts of land for any particular year, because the soils vary somewhat from place to place, management practices differ slightly from farm to farm, and weather conditions vary from year to year. Nevertheless, these estimates appear to be as accurate a guide as can be obtained without further detailed and lengthy investigations. They are useful in showing the relative productivity of the soils and how soils respond to improved management.

The management needed to obtain yields in columns A consists of (a) using cropping systems that maintain tilth and organic-matter content; (b) using management practices that control erosion sufficiently to prevent a great reduction in the quality of the soil; (c) applying fertilizers and lime in moderate amounts, as indicated by soil tests; (d) returning crop residues to the soil; (e) plowing and tilling by conventional methods; (f) using crop varieties generally adapted to the climate and soils; (g) controlling weeds moderately well by tillage and spraying; and (h) draining wet land enough to permit cropping; in some places yields are somewhat restricted by wetness.

The management needed to obtain yields in columns B consists of (a) using a cropping system that maintains tilth and organic-matter content; (b) using the cultivation methods, mechanical practices, or both, that are needed to control erosion and thereby maintain or improve the quality of the soil; (c) maintaining a high level of available phosphorus, potassium, and nitrogen, as indicated by frequent soil tests and according to the recommendations of the Purdue University Agricultural Experiment Station; (d) liming the soils as indicated by soil tests and according to recommendations; (e) using crop residues to improve the soils; (f) practicing minimum tillage; (g) using only the best-adapted varieties of crops; (h) tilling and spraying to control weeds; and (i) adequately draining wet soils.

Yields higher than those listed in columns B of table 2 are possible. On some soils heavy additions of nitrogen, phosphorus, and potassium are profitable. Some farmers produce more than 145 bushels of corn or more than 45 bushels of soybeans per acre. In some places, on light-colored or sandy soils, nitrogen can be added as a side dressing. Consult your district conservationist, county agent, or specialists at the experiment station for suggestions on the kinds and amounts of fertilizer and lime and the seed mixtures to use.

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Wildlife

The soils, topography, climate, wide variety of native and other suited kinds of vegetation, and other features combine to favor wildlife habitat development in Shelby County. These features provide a high potential for managing the land to increase and maintain various kinds of wildlife.

In table 3 the soils of Shelby County are rated according to their capability for providing habitat for three major kinds of wildlife. These are openland wildlife, woodland wildlife, and wetland wildlife. There is a high potential for openland wildlife and woodland wildlife habitat development throughout most of the county. Only specific areas are suitable for wetland wildlife habitat development. The three major kinds of wildlife are defined as follows:

OPENLAND WILDLIFE.—Birds, mammals, and reptiles that normally frequent cropland, pasture, and hayland that is overgrown with grasses, herbs, and shrubs. Examples of openland wildlife are rabbits, red fox, skunks, quail, and meadowlarks. Elements of wildlife habitat used in rating soils for openland wildlife include grain crops, grasses and legumes, wild herbaceous upland plants, and hardwood woodland plants.

WOODLAND WILDLIFE.—Mammals and birds that frequent areas of hardwood and coniferous trees, shrubs, or a combination of these. Examples of woodland wildlife are squirrels, deer, raccoons, woodpeckers, and nuthatches. Elements of wildlife habitat used in rating soils for this kind of wildlife include grasses and legumes, wild herbaceous upland plants, hardwood woodland plants, and coniferous woodland plants.

WETLAND WILDLIFE.—Mammals, birds, and reptiles that frequent wet areas, such as ponds, marshes, and swamps. Examples of wetland wildlife are muskrats, wild ducks and geese, and kingfishers. Elements of wildlife habitat used in rating soils for this kind of wildlife include wetland food and cover plants, seed-grain crops, shallow water developments, and excavated ponds.

If a soil is rated other than well suited in table 3, the major reason for the rating is listed. A rating of "well suited" means habitats are generally easily created, improved, or maintained. There are few or no limitations that affect management. A rating of "suited" means habitats usually can be created, improved, or maintained; but there are some limitations that affect management. A rating of "poorly suited" means habitats can usually be created, improved, or maintained, but there are rather severe problems that must be overcome. An "unsuited" rating means it is very questionable whether habitat can be created, improved, or maintained and is generally impractical under prevailing conditions.

Use of the Soils for Woodland

When the first white settlers came to Shelby County in about 1820, they found it covered with a vast forest of hardwoods. Since then, most of the land has been cleared and is being used for crops. In 1964 only about 5.5 percent

TABLE 2.—*Predicted average acre yields of the principal crops under two levels of management*

[Yields in columns A are those obtained under the management commonly practiced; those in columns B are yields to be expected under improved management. Dashes indicate that the soil is not suited to the crop specified, or that the crop ordinarily is not grown]

Soil	Corn		Soybeans		Wheat		Legume-grass hay mixture	
	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*
Ayrshire fine sandy loam	75	110	28	40	30	43	2.5	4.5
Brookston silty clay loam	80	135	30	45	30	53	3.0	5.0
Corydon stony silt loam, 18 to 35 percent slopes	--	--	--	--	--	--	--	--
Crosby silt loam, 0 to 2 percent slopes	80	120	28	45	30	50	3.0	5.0
Crosby silt loam, 2 to 4 percent slopes	80	110	25	40	30	45	3.0	5.0
Crosby-Miami silt loams, 0 to 6 percent slopes	65	100	25	40	32	43	2.5	4.5
Eel silt loam	75	110	30	43	32	45	2.5	4.0
Fox loam, 0 to 2 percent slopes	60	90	20	30	30	50	2.5	4.5
Fox loam, 2 to 6 percent slopes, eroded	50	75	17	30	30	45	2.5	4.5
Fox loam, 6 to 12 percent slopes, eroded	45	70	15	28	25	35	2.5	4.0
Fox loam, 12 to 18 percent slopes, eroded	30	50	10	20	20	30	2.0	3.5
Fox loam, loamy substratum, 0 to 3 percent slopes	65	95	28	40	35	50	3.0	4.5
Fox clay loam, 2 to 6 percent slopes, severely eroded	50	70	18	33	25	35	2.5	3.5
Fox clay loam, 6 to 12 percent slopes, severely eroded	30	45	13	24	20	30	2.5	3.5
Genesee loam	75	120	30	45	20	45	2.5	5.0
Genesee sandy loam, sandy variant	40	60	15	25	--	--	2.0	3.0
Gravel pits	--	--	--	--	--	--	--	--
Hennepin loam, 18 to 25 percent slopes	--	--	--	--	--	--	--	--
Hennepin loam, 25 to 50 percent slopes	--	--	--	--	--	--	--	--
Kokomo silty clay loam	75	100	28	45	20	40	2.5	5.0
Linwood muck	75	100	22	40	--	--	--	--
Martinsville loam, 0 to 2 percent slopes	75	115	30	45	36	55	3.0	5.5
Martinsville loam, 2 to 6 percent slopes, eroded	65	110	28	40	32	45	2.5	5.0
Medway silt loam	75	110	30	45	32	40	2.5	4.5
Miami silt loam, 2 to 6 percent slopes, eroded	65	110	30	45	35	45	2.5	5.0
Miami silt loam, 6 to 12 percent slopes, eroded	53	90	25	35	28	38	2.5	4.5
Miami silt loam, 12 to 18 percent slopes, eroded	45	65	20	30	25	35	2.0	3.5
Miami clay loam, 2 to 6 percent slopes, severely eroded	55	95	25	35	30	38	2.5	4.5
Miami clay loam, 6 to 12 percent slopes, severely eroded	45	75	20	30	20	33	2.5	4.0
Miami clay loam, 12 to 18 percent slopes, severely eroded	--	--	--	--	15	25	2.0	3.0
Miami-Crosby silt loams, 0 to 6 percent slopes	60	100	25	35	30	40	3.0	4.0
Millsdale silty clay loam	65	100	30	40	25	35	2.5	4.0
Milton silt loam, 1 to 6 percent slopes	50	80	22	33	20	35	2.5	4.0
Negley loam, 12 to 18 percent slopes, eroded	36	55	15	25	18	30	2.5	3.5
Negley loam, 18 to 25 percent slopes	--	--	--	--	--	--	--	--
Nineveh loam, 0 to 2 percent slopes	60	95	20	30	30	45	2.5	4.5
Nineveh loam, 2 to 6 percent slopes	50	80	20	30	30	45	2.5	4.0
Ockley loam, 0 to 2 percent slopes	70	115	30	45	37	55	3.5	5.5
Parke silt loam, 2 to 6 percent slopes, eroded	60	90	25	35	30	40	3.0	5.0
Parke silt loam, 6 to 12 percent slopes, eroded	50	75	18	28	25	35	2.5	4.0
Princeton fine sandy loam, 0 to 2 percent slopes	65	90	20	30	30	45	3.0	4.5
Princeton fine sandy loam, 2 to 6 percent slopes	60	85	18	28	30	43	3.0	4.0
Princeton fine sandy loam, 6 to 12 percent slopes	55	75	15	25	25	35	2.5	3.0
Quarries	--	--	--	--	--	--	--	--
Randolph silt loam	70	90	25	35	25	35	2.5	3.5
Rensselaer clay loam	85	135	30	45	35	53	3.0	5.5
Rodman gravelly loam, 18 to 35 percent slopes	--	--	--	--	--	--	--	--
Ross silt loam	75	110	30	45	32	40	3.0	4.5
Ross loam, moderately deep variant	50	65	18	28	25	35	2.5	3.5
Saranac silty clay loam	60	100	28	38	--	--	2.0	3.0
Sebewa clay loam	65	90	25	35	20	35	2.5	3.5
Shoals silt loam	70	90	28	38	15	30	2.0	3.0
Sleeth loam	75	120	28	45	30	50	3.0	5.5
Westland clay loam	80	125	30	50	30	55	3.0	5.5
Westland and Brookston loams, overwash	80	125	30	45	30	55	3.0	5.5
Whitaker loam	75	110	30	45	30	50	3.0	5.5

of the land was still wooded. Much of this woodland is in poor condition, mainly because trees of high quality have been cut and those remaining are poorly formed and of low quality. The quality of the trees is further lowered by the grazing of hogs and cattle. Continual grazing compacts the soil, slows the growth of trees, and prevents reseeding. Many, small, level and gently sloping wooded areas are being cleared for crops. There are a few wooded areas in the county that have a good stand of high quality trees, such as oaks, tulip-poplar, and walnut.

TABLE 3.—*Suitability of soils for wildlife habitat development*

[Interpretations are not given for Gravel pits (Gp) and Quarries (Qu), because these miscellaneous land types have variable properties]

Soil series and map symbols	Openland wildlife	Woodland wildlife	Wetland wildlife
Ayrshire: Ay	Well suited	Suited: somewhat poorly drained; poorly suited to coniferous woodland plants; suited to grasses and legumes.	Suited: somewhat poorly drained; suited to wetland food and cover plants; fair for shallow-water developments and excavated ponds.
Brookston: Br	Poorly suited: very poorly drained, depressional soil; unsuitable for grain and seed crops; poorly suited to grasses and legumes and to wild herbaceous upland plants.	Suited: very poorly drained	Well suited.
Corydon: CoE	Unsuited: erosion hazard; unsuitable for grain and seed crops and grasses and legumes; poorly suited to wild herbaceous plants and hardwood plants; shallow to bedrock.	Unsuited: erosion hazard; very poorly suited to hardwood woodland plants; poorly suited to coniferous woodland plants.	Unsuited: well-drained, steep soil; unsuited to wetland food and cover plants and to shallow-water developments and excavated ponds.
Crosby: CrA, CrB, CsB	Well suited	Suited: somewhat poorly drained; suited to hardwood woody plants; poorly suited to coniferous plants.	Suited where slopes are 0 to 2 percent: somewhat poorly drained; suited to wetland food and cover plants, shallow-water developments, and excavated ponds; fluctuating water table. Poorly suited where slopes are 2 to 6 percent: somewhat poorly drained; poorly suited to shallow-water developments and wetland food and cover plants.
Eel: Ee	Well suited	Well suited	Unsuited: moderately well drained; poorly suited or unsuited to wetland food and cover plants, shallow-water developments, and excavated ponds.
Fox: FoA, FoB2, FoC2, FoD2, FsA, FxB3, FxC3.	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants and to shallow-water developments and excavated ponds.
Genesee: Ge	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants and to shallow-water developments and excavated ponds.
Genesee series, sandy variant: Gn.	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants and to excavated ponds and shallow-water developments.
Hennepin: HeE, HeF	Suited: erosion hazard; steep soil; poorly suited to grain and seed crops, grasses and legumes; well suited to hardwood woodland plants.	Suited: erosion hazard; steep soil; poorly suited to coniferous woodland plants; suited to grasses and legumes.	Unsuited: steep soil; unsuited to wetland food and cover plants, shallow-water developments, and excavated ponds.
Kokomo: Ko	Poorly suited: very poorly drained; unsuitable for grain and seed crops; poorly suited to grasses and legumes.	Well suited	Well suited.

TABLE 3.—*Suitability of soils for wildlife habitat development*—Continued

Soil series and map symbols	Openland wildlife	Woodland wildlife	Wetland wildlife
Linwood: Lm	Unsuited: organic soil; high water table; unsuitable for grain and seed crops and grasses and legumes.	Unsuited: organic soil; high water table; unsuitable for hardwood woodland plants and for coniferous plants.	Suited: well suited to shallow-water developments; suited to wetland food and cover plants.
Martinsville: MaA, MaB2	Well suited	Well suited: poorly suited to coniferous woody plants.	Unsuited: stratified silt and sand underlies soil profile; unsuitable for wetland food and cover plants and shallow-water developments.
Medway: Me	Well suited	Well suited	Poorly suited: poorly suited to wetland food and cover plants and to shallow-water developments.
Miami: MIB2, MIC2, MID2, MmB3, MmC3, MmD3, MrB.	Well suited (suited on severely eroded soils).	Well suited (suited on severely eroded soils).	Unsuited: sloping soil; unsuitable for wetland food and cover plants and shallow-water developments.
Millsdale: Ms	Poorly suited: poor drainage; unsuitable for grain and seed crops; poorly suited to grasses and legumes.	Well suited	Suited: well suited to wetland food and cover plants and to shallow-water developments; unsuitable for ponds because soil is shallow over limestone.
Milton: MtB	Well suited	Well suited	Unsuited: shallow to bedrock; unsuited to wetland food and cover plants and to shallow-water developments.
Negley: NeD2, NeE	Well suited	Well suited	Unsuited: well drained; coarse textured in subsoil and below; unsuited to wetland food and cover plants and to shallow-water developments and ponds.
Nineveh: NnA, NnB	Well suited	Well suited	Unsuited: shallow over gravel; unsuited to wetland food and cover plants and to shallow-water developments.
Ockley: OcA	Well suited	Well suited	Unsuited: shallow over gravel; unsuited to wetland food and cover plants and to shallow-water developments.
Parke: PaB2, PaC2	Well suited	Well suited	Unsuited: well drained; coarse textured in subsoil and below; unsuited to wetland food and cover plants, shallow-water developments, and ponds.
Princeton: PrA, PrB, PrC	Well suited	Well suited	Unsuited: well drained; coarse textured in subsoil and below; sloping soil; unsuited to wetland food and cover plants, shallow-water developments, and ponds.

TABLE 3.—*Suitability of soils for wildlife habitat development*—Continued

Soil series and map symbols	Openland wildlife	Woodland wildlife	Wetland wildlife
Randolph: Ra	Well suited	Suited: shallow over bedrock; poorly suited to coniferous plants.	Suited: shallow over bedrock; suited to wetland food and cover plants and shallow-water developments; unsuitable for ponds.
Rensselaer: Re	Well suited	Suited to hardwood woody plants; very poorly drained; well suited to coniferous woody plants.	Well suited.
Rodman: RoE	Unsuited: steep slopes; erosion hazard; shallow over gravel; unsuited to grain and seed crops and to grasses and legumes.	Poorly suited: steep slopes; shallow over gravel; unsuited to hardwood woody plants; well suited to coniferous woody plants.	Unsuited: steep slopes; erosion hazard; shallow over gravel; unsuited to wetland food and cover plants, shallow-water developments, and ponds.
Ross: Rt	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow-water developments, and ponds.
Ross series, moderately deep variant: Rs.	Well suited	Well suited	Unsuited: well drained; shallow over sand and gravel; unsuited to wetland food and cover plants, shallow-water developments, and ponds.
Saranac: Sa	Poorly suited: very poorly drained; unsuitable for grain and seed crops; poorly suited to grasses and legumes.	Well suited	Suited: very poorly drained; suited to wetland food and cover plants: well suited to shallow-water developments.
Sebewa: Se	Poorly suited: poorly drained; unsuitable for grain and seed crops; poorly suited to grasses and legumes.	Well suited	Well suited.
Shoals: Sh	Well suited	Suited: somewhat poorly drained; subject to flooding; suitable for hardwood woody plants; poorly suited to coniferous woody plants.	Suited: somewhat poorly drained; subject to flooding; suited to wetland food and cover plants; poorly suited to ponds.
Sleeth: Sm	Well suited	Suited: poorly suited to coniferous plants; suited to grasses and legumes.	Suited: somewhat poorly drained; suited to wetland food and cover plants and to shallow-water developments.
Westland: Wc, We	Poorly suited: very poorly drained; unsuitable for grain and seed crops; poorly suited to grasses and legumes.	Well suited	Well suited.
Whitaker: Wh	Well suited	Suited: somewhat poorly drained; suited to grain and seed crops and to grasses and legumes; poorly suited to coniferous woody plants.	Suited: somewhat poorly drained; suited to wetland food and cover plants, shallow-water developments, and ponds.

Most soils in the county are well suited to the production of high quality trees, provided they are protected from grazing. Some soils, such as Genesee, Parke, and Negley, are well suited to black walnut trees. Black walnut plantations have been established on areas of Genesee soils. Woodland management information can be obtained from the Soil Conservation Service, the Purdue Extension Service, and the Indiana Department of Natural Resources.

The types of trees that normally grow on soils in certain capability units are listed in the discussion of the capability units.

Use of the Soils for Recreation

Outdoor recreational activity, already a major part of American life, is expected to triple by the year 2000 (*3*). Outdoor recreation is becoming important in local land use planning. The location of Shelby County in relationship to centers of population and the resources of the county make it possible to develop some income-producing enterprises. The most likely enterprises are hunting areas, shooting preserves, improved picnic areas, and ponds and lakes for fishing and water sports. Already, several borrow pits made by excavating material for road fills on I–74 have been developed for fishing and swimming.

In table 4 the soils in Shelby County are rated according to their limitations for developing five kinds of recreational facilities. These are campsites for tents and trailers; picnic grounds, parks, and extensive play areas; playgrounds and athletic fields; paths and trails; and golf course fairways.

The ratings used in table 4 are slight, moderate, and severe. For a rating other than slight, the degree of limitation of the soil for developing a specific recreational facility is also given.

TABLE 4.—*Degree of limitations and soil features affecting recreational uses*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. Because these soils may have different limitations, it is necessary to follow carefully the instructions for referring to other series appearing in the first column. Interpretations are not given for Gravel pits (Gp) and Quarries (Qu) because these land types have variable properties]

Soil series and map symbols	Campsites	Picnic grounds, parks, and extensive play areas	Playgrounds and athletic fields	Paths and trails	Golf course fairways
Ayrshire: Ay	Moderate: slow to dry after rains.	Moderate: seasonally high water table; slow to dry after rains.	Moderate: seasonally high water table; slow to dry after rains.	Moderate: seasonally high water table; muddy when wet.	Moderate: slow to dry after rains; seasonally high water table.
Brookston: Br	Severe: ponding of surface water; high water table; remains wet for long periods of time.	Severe: ponding of surface water; high water table; sticky and slippery when wet.	Severe: ponding of surface water; high water table; sticky and slippery when wet.	Severe: wet for long periods of time; sticky and slippery when wet.	Severe: subject to ponding; slow to dry after rains.
Corydon: CoE	Severe: steep slopes; stones on the surface; shallow over bedrock.	Severe: steep slopes; stones on the surface; shallow over bedrock.	Severe: steep slopes; stones on the surface; shallow over bedrock.	Severe: steep slopes; stones on the surface; shallow over bedrock.	Severe: steep slopes; stones on the surface; shallow over bedrock.
*Crosby: CrA, CrB, CsB. For limitations of the Miami soil in CsB, see Miami series.	Moderate: seasonally high water table; slow to dry after rains.	Moderate: seasonally high water table; slow to dry after rains.	Severe: seasonally high water table; slow to dry after rains; slow permeability.	Moderate: slow to dry after rains.	Moderate: slow to dry after rains.
Eel[1]: Ee	Slight if area does not flood during season of use.	Slight if area does not flood during season of use.	Moderate: subject to flooding, usually during winter or early in spring.	Moderate: subject to flooding, usually during winter or early in spring.	Moderate: subject to flooding, usually during winter or early in spring.
Fox: FoA, FoB2, FoC2, FoD2, FsA, FxB3, FxC3.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent, and severe where slope is 12 to 18 percent: subject to erosion on slopes.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent, and severe where slope is 12 to 18 percent: subject to erosion on slopes; droughty during long dry season.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent, and severe where slope is 12 to 18 percent: subject to erosion on slopes; droughty during long dry season.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent, and severe where slope is 12 to 18 percent: subject to erosion on slopes.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent, and severe where slope is 12 to 18 percent: droughty during long dry season.

See footnote at end of table.

TABLE 4.—*Degree of limitations and soil features affecting recreational uses*—Continued

Soil series and map symbols	Campsites	Picnic grounds, parks, and extensive play areas	Playgrounds and athletic fields	Paths and trails	Golf course fairways
Genesee: Ge	Slight if area does not flood during season of use.	Slight if area does not flood during season of use.	Moderate: subject to flooding, usually during winter and early in spring.	Moderate: subject to flooding, usually during winter and early in spring.	Moderate: subject to flooding, usually during winter and early in spring.
Genesee series, sandy variant: Gn.	Slight if area does not flood during season of use.	Slight if area does not flood during season of use.	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding, usually during winter and early in spring; somewhat droughty during long dry seasons.
Hennepin: HeE, HeF.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Kokomo: Ko	Severe: subject to ponding; high water table; remains wet for long periods.	Severe: ponding of surface water; high water table; sticky and slippery when wet.	Severe: ponding of surface water; high water table; sticky and slippery when wet.	Severe: ponding of surface water; remains wet for long periods; slippery when wet.	Severe: ponding of surface water; remains wet for long periods.
Linwood: Lm	Severe: subject to ponding; high water table; remains wet for long periods.	Severe: subject to ponding; high water table.	Severe: subject to ponding; high water table.	Very severe: high water table; remains wet for long periods; soft when wet.	Severe: high water table; unstable material; surface does not remain smooth after freezing and thawing.
Martinsville: MaA, MaB2.	Slight	Slight	Slight	Slight	Slight.
Medway [1]: Me	Slight if area does not flood during season of use.	Slight if area does not flood during season of use.	Moderate: subject to flooding, usually during winter and early spring.	Moderate: subject to flooding; usually during winter and early in spring.	Moderate: subject to flooding.
*Miami: MlB2, MlC2, MlD2, MmB3, MmC3, MmD3, MrB. For limitations of the Crosby soils in MrB, see the Crosby series.	Slight where slope is 2 to 6 percent, moderate where slope is 6 to 12 percent.	Slight where slope is 2 to 6 percent, moderate where slope is 6 to 12 percent.	Moderate where slope is 2 to 6 percent, severe where slope is 6 to 12 percent: subject to erosion.	Moderate: 2 to 12 percent slopes; subject to erosion; eroded spots when wet.	Slight where slope is 2 to 6 percent, moderate where slope is 6 to 12 percent, and severe where slope is 12 to 18 percent: subject to erosion.
Millsdale: Ms	Severe: subject to ponding; high water table; remains wet for long periods.	Severe: subject to ponding; high water table.	Severe: subject to ponding; high water table.	Severe: subject to ponding of surface water; remains wet for long periods; slippery when wet.	Severe: subject to ponding of surface water; slow to dry after rains.
Milton: MtB	Slight	Slight	Slight	Slight	Slight to moderate: stones at depth of 24 to 42 inches.
Negley: NeD2, NeE.	Severe: slopes greater than 12 percent.	Severe: slopes greater than 12 percent.	Severe: slopes greater than 12 percent.	Severe: slopes greater than 12 percent.	Severe: slopes greater than 12 percent.
Nineveh: NnA, NnB.	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 4.—*Degree of limitations and soil features affecting recreational uses*—Continued

Soil series and map symbols	Campsites	Picnic grounds, parks, and extensive play areas	Playgrounds and athletic fields	Paths and trails	Golf course fairways
Ockley: OcA	Slight	Slight	Slight	Slight	Slight.
Parke: PaB2, PaC2.	Slight where slope is 2 to 6 percent, moderate where slope is 6 to 12 percent: subject to erosion.	Slight where slope is 2 to 6 percent, moderate where slope is 6 to 12 percent: subject to erosion.	Slight where slope is 2 to 6 percent, severe where slope is 6 to 12 percent; subject to erosion.	Slight where slope is 2 to 6 percent, moderate where slope is 6 to 12 percent: eroded spots; slippery when wet.	Slight where slope is 2 to 6 percent, moderate where slope is 6 to 12 percent.
Princeton: PrA, PrB, PrC.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent.	Slight where slope is 0 to 2 percent, moderate where slope is 2 to 6 percent, and severe where slope is 6 to 12 percent: subject to erosion.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent: subject to erosion.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent.
Randolph: Ra	Moderate: seasonally high water table; slow to dry after rains.	Moderate: seasonally high water table; slow to dry after rains.	Severe: seasonally high water table; slow to dry after rains; moderately slow permeability.	Moderate: seasonally high water table; slow to dry after rains.	Moderate: seasonally high water table; slow to dry after rains; bedrock at depth of 24 to 42 inches may cause problems in installing drainage systems.
Rensselaer: Re	Severe: subject to ponding; high water table; remains wet for long periods.	Severe: subject to ponding; high water table; surface sticky and slippery when wet.	Severe: subject to ponding; high water table; surface sticky and slippery when wet.	Severe: subject to ponding; high water table; surface sticky and slippery when wet.	Severe: subject to ponding; high water table; surface sticky and slippery when wet.
Rodman: RoE	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Ross: Rt	Severe: subject to flooding.	Moderate: subject to flooding, usually in winter or early in spring.	Moderate: subject to flooding, usually in winter or early in spring.	Moderate	Moderate.
Ross series, moderately deep variant [1]: Rs.	Severe: subject to flooding.	Moderate: subject to flooding, usually in winter or early in spring.	Moderate: subject to flooding, usually in winter or early in spring.	Moderate: subject to flooding, usually in winter or early in spring.	Moderate: subject to flooding, usually in winter or early in spring.
Saranac [1]: Sa	Very severe: subject to flooding; high water table; slow to dry after rains.	Very severe: subject to flooding; high water table; surface sticky and slippery when wet.	Very severe: subject to flooding; high water table; surface sticky and slippery when wet.	Very severe: subject to flooding and ponding; remains wet for long periods of time; slippery when wet.	Very severe: subject to flooding and ponding of surface water; remains wet for long periods of time.
Sebewa: Se	Severe: subject to ponding; high water table; remains wet for long periods of time.	Severe: subject to ponding; high water table; surface sticky and slippery when wet.	Severe: subject to ponding; high water table; surface sticky and slippery when wet.	Severe: subject to ponding of surface water; remains wet for long periods of time; slippery when wet.	Severe: subject to ponding of surface water; remains wet for long periods of time.

See footnote at end of table.

TABLE 4. *Degree of limitations and soil features affecting recreational uses*—Continued

Soil series and map symbols	Campsites	Picnic grounds, parks, and extensive play areas	Playgrounds and athletic fields	Paths and trails	Golf course fairways
Shoals [1]: Sh	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; high water table; slow to dry after rains.	Severe: subject to flooding; high water table; slow to dry after rains.	Moderate: subject to flooding.	Moderate: subject to flooding.
Sleeth: Sm	Moderate: seasonal high water table; slow to dry after rains.	Moderate: seasonal high water table; slow to dry after rains.	Moderate: seasonal high water table; slow to dry after rains.	Moderate: seasonal high water table; slow to dry after rains.	Moderate: slow to dry after rains.
*Westland: Wc, We. For Brookston part of We, see Brookston series.	Severe: subject to ponding; high water table; remains wet for long periods of time.	Severe: subject to ponding; high water table; sticky and slippery when wet.	Severe: subject to ponding; high water table; sticky and slippery when wet.	Severe: subject to ponding of surface water; remains wet for long periods of time.	Severe: subject to ponding of surface water; remains wet for long periods of time.
Whitaker: Wh	Moderate: seasonal high water table; slow to dry after rains.	Moderate: seasonal high water table; slow to dry after rains.	Moderate: seasonal high water table; slow to dry after rains.	Moderate: slow to dry after rains.	Moderate: slow to dry after rains.

[1] Frequency and intensity of flooding extremely variable; onsite inspection required.

A rating of *slight* means the facility is easily developed, improved, or maintained. There are few or no limitations that affect design or management. A *moderate* limitation means the facility usually can be developed, improved, or maintained, but there are moderate limitations to design and management. A rating of *severe* means the practicability of establishing the facility is questionable. Extreme measures are needed to overcome the limitation, and such use of the soil is generally unsound or not practical.

Engineering Uses of the Soils [2]

Soils are of special interest to professional engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. Among the properties most important to the engineer are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and pH. Depth to water table and to bedrock is also important. Soil development related to topographic position may be significant.

The soil survey for Shelby County contains information that can be used by professional engineers to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway (fig. 19) and airport locations and in planning detailed soil surveys of the selected locations.
3. Assist in planning of drainage systems, farm ponds (fig. 20), diversion terraces, and other structures for soil and water conservation.
4. Locate possible sources of sand and gravel.
5. Correlate performance of structures with soil mapping units and, thus, develop information that can be useful in designing and maintaining new structures.

Figure 19.—Section of Interstate Highway 74 on Brookston and Crosby soils.

[2] Engineering section reviewed by PETER FORSYTHE, assistant State conservation engineer, and WAYNE E. MOORE, area engineer, Soil Conservation Service.

Figure 20.—Farm pond in an area of Miami and Hennepin soils.

6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and from aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

It is not intended that this survey will eliminate the need for onsite sampling and testing of soils for design and construction of specific works and uses. The interpretations in the soil survey should be used primarily in planning more detailed field investigations in determining the condition of soil material in place at the proposed site.

Tables 5, 6, and 7 provide soil data useful in engineering. Only the data in table 5 are from actual laboratory tests. The estimates in tables 6 and 7 are based on a comparison of soils with those tested. At many construction sites, major variations in the soil may occur within the depth of the proposed excavations, and several soils may occur within a short distance. Specific laboratory data on engineering properties of the soil should be determined for the soil at the site before any engineering work is planned in detail.

Some of the terms used by the soil scientist may be unfamiliar to the engineer; and some words, such as soil, clay, silt, sand, aggregate, and granular, have special meanings in soil science. Most of these terms, as well as other special terms that are used in the soil survey, are defined in the Glossary.

Information useful for engineering can be obtained from the soil map. It will often be necessary, however, to refer to other parts of the survey. By using the information in the soil map, the soil profile descriptions, and the tables in this section, the engineer can plan a detailed survey of the soil at the construction site.

Engineering classification systems

Two systems for classification of soils are in general use among engineers. Most highway engineers classify soil material according to the system used by the American Association of State Highway Officials. Other engineers prefer to use the Unified Soil Classification System. Both classification systems are used in this survey in tables 5 and 6 and are briefly described here.

AASHO classification system.—Highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway

Officials (*1*). In this system, all soil materials are classified in seven principal groups, based on mechanical analyses and plasticity test data. The groups range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrades) to A–7, (clay soils having low strength when wet, the poorest soils for subgrades). Highly organic soils, such as peat and muck, are not included in this classification, as their use as a construction material or foundation material should be avoided.

Within each of the principal groups, the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best materials to 20 for the poorest. The group index number for several of the soils of Shelby County are shown in parentheses following the soil group symbol, in the next to last column in table 5. The estimated AASHO classification for all of the soils of the county is given in table 6.

Unified classification system.—Some engineers prefer to use the Unified Soil Classification System (*8*). This system is based on identification of soils according to their texture and plasticity and their performance as engineering construction materials. In the Unified system, soil materials are identified as coarse grained (eight classes), fine grained (six classes), or highly organic. The classification of the tested soils according to the Unified system is given in table 5, and the estimated classification of all the soils is given in table 6.

Engineering test data

Soil samples were taken from five locations in Shelby County. Only selected layers of each soil were sampled. The test results have been used as a general guide in estimating the engineering properties of the soils of the county.

Table 5 presents data on the relationship between the moisture content and the compacted density of the soil. If the soil material is compacted at successively higher moisture content, assuming that the same amount of force is used in compacting the soil, the density of the compacted material will increase until the "optimum moisture content" is reached. After that, the density decreases with increase in moisture content. The oven-dry weight in pounds per cubic foot of the soil at the optimum moisture content is the "maximum dry density." Data on the relationship of moisture to density are important in planning earthwork, because generally the soil is most stable if it is compacted to about its maximum dry density when it is at approximately the optimum moisture content.

California bearing ratio (CBR) gives the load-supporting capacity of a soil as compared to that of standard crushed limestone. A soil with a CBR of 16 will support 16 percent of the load that would be supported by standard crushed limestone, per unit area and with the same degree of distortion.

Mechanical analyses were made by a combination of the sieve and hydrometer methods. The liquid limit and plasticity index were determined. The results of these tests and the classification of each sample according to both the AASHO and the Unified systems are given in table 5.

The names for the various sizes of sand, silt, and clay as used by engineers are not equivalent to the names used by soil scientists. To soil scientists, for example, "clay" refers to mineral grains less than 0.002 millimeter in diameter, whereas engineers frequently define "clay" size as being less than 0.005 millimeter in diameter.

The liquid limit and plastic limit tests on the soil samples measure the effect of water on the consistency of soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from the plastic state to a liquid state (the liquid limit). The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Estimated engineering properties

In table 6 are estimates of the soil properties significant in engineering for all soils in Shelby County. Since actual tests were made only for those soils listed in table 5, it was necessary to estimate the engineering properties for the remainder of the soils. This was done by comparing them with those soils which were sampled and tested, and based upon experiences gained from working with and observing similarly classified soils in other areas. These estimates provide information about the soils that an engineer would otherwise have to obtain for himself. However, the estimates are not a substitute for the detailed tests needed at a specific site selected for construction. The information in this table, in general, applies to soil at a depth of five feet or less.

Depth to seasonal high water table.—In this column the average depth to the natural seasonal high water table of the soil in its undrained condition is given.

Depth from surface.—Normally, only the depth for the major horizons are listed. Special horizons are listed if they have engineering properties significantly different from the adjacent horizons.

Percentages passing sieves 10, 40, and 200.—The values in these columns are estimates and are rounded off to the nearest 5 percent. When there is little gravel-size material present (No. 10 sieve), the percentage of material, passing the 200 sieve approximates the amount of silt and clay in a soil.

Permeability.—Refers to movement of water downward through undisturbed soil material. Estimates are based largely on texture, structure, and consistency.

Available moisture capacity.—The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Reaction.—This column lists estimated ranges in field pH values for each major horizon.

Shrink-swell potential.—That quality of the soil that determines its volume change with moisture content. Estimated primarily on the basis of the amount and kind of clay in a soil.

TABLE 5.—*Engineering*

[Tests performed by Purdue University, in cooperation with Indiana State Highway Department and U.S. Department of Commerce,

Soil name and location	Parent material	Report No.	Depth from surface	Moisture-density data [1]		California bearing ratio (CBR) test [2]			
				Maximum daily density	Optimum moisture	Molded specimen		CBR	Swell
						Dry density	Moisture		
			Inches	*Lb. per cu. ft.*	*Percent*	*Lb. per cu. ft.*	*Percent*	*Percent*	
Brookston silty clay loam: NE¼NW¼ sec. 7, T. 12 N., R. 7 E. (Modal)	Glacial till.	73–5–1	0–7	89	29	------	------	------	------
		73–5–2	20–34	108	18	107. 0	17. 4	6	0. 44
		73–5–3	38–48	122	11	124. 8	10. 9	20	. 11
Nineveh loam: SE¼SW¼ sec. 29, T. 13 N., R. 7 E. (Modal)	Silty and loamy material over outwash.	73–4–1	0–5	116	14	116. 9	13. 5	5	. 00
		73–4–2	13–25	112	14	114. 0	14. 7	7	. 07
		73–4–3	35–45	126	10	126. 0	10. 8	62	. 04
Ockley loam: Southwest corner of SW¼ sec. 35, T. 13 N., R. 5 E. (Modal)	Loamy outwash material over stratified gravel and sand.	73–1–1	0–7	112	16	112. 0	14. 9	2	. 84
		73–1–2	27–35	107	18	108. 0	17. 6	8	. 20
		73–1–3	46–60	135	8	131. 1	8. 2	92	. 02
SW¼NE¼ sec. 14, T. 13 N., R. 5 E. (Medium-textured subsoil)	Loamy outwash material over stratified gravel and sand.	73–2–1	0–8	109	16	110. 2	15. 8	5	. 02
		73–2–2	16–29	110	16	110. 4	15. 3	16	2. 40
		73–2–3	46–56	117	12	117. 5	12. 0	32	. 00
Westland clay loam: SW¼SE¼ sec. 26, T. 12 N., R. 6 E. (Modal)	Glacial outwash deposits.	73–3–1	4–11	105	18	105. 7	18. 4	7	. 27
		73–3–2	21–45	109	18	110. 1	17. 4	5	. 13
		73–3–3	50–60	132	8	128. 8	8. 0	65	. 00

[1] Based on AASHO Designation T 99–57, Method A (*1*).
[2] Based on AASHO Designation T 87–49 (*1*). The CBR value is for 0.1-inch penetration.
[3] Mechanical analysis according to AASHO Designation T 88–57 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters

test data

Bureau of Public Roads, in accordance with standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [3]											Liquid limit	Plasticity index	Classification	
Percentage passing sieve—							Percentage smaller than—						AASHO	Unified [4]
1½ inch	1 inch	¾ inch	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
											Percent			
------	------	------	99	99	92	74	70	60	35	22	43	19	A-7-6(11)	CL
------	------	------	------	100	96	80	75	60	35	27	40	21	A-6(12)	CL
------	100	98	94	92	85	53	48	34	19	13	23	7	A-4(4)	ML-CL
------	100	97	90	88	70	49	47	35	13	7	35	13	A-6(4)	SM-SC
------	------	100	88	74	47	31	31	30	25	22	51	31	A-2-7(3)	SC
100	86	79	58	46	14	5	3	3	3	3	(5)	(5)	A-1-a(0)	SW-SM
------	------	100	99	99	90	60	56	40	19	13	26	9	A-4(5)	CL
100	95	91	84	82	62	45	45	41	31	30	60	42	A-7-6(9)	SC
100	80	76	58	44	25	8	7	5	5	4	(5)	(5)	A-1-a(0)	SW-SM
------	100	97	96	94	85	54	45	25	5	2	32	9	A-4(4)	ML-CL
------	------	100	88	77	41	38	37	34	27	22	47	27	A-7-6(5)	SC
------	------	------	92	83	44	15	14	12	8	8	(5)	(5)	A-1-b(0)	SM
------	------	------	97	90	73	49	49	40	28	23	48	25	A-7-6(8)	SC
------	------	100	95	90	79	60	57	50	35	25	44	27	A-7-6(12)	CL
------	------	100	72	53	28	9	9	8	6	6	(5)	(5)	A-1-b(0)	SW-SM

in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for naming textural classes of soil.

[4] The Soil Conservation Service and the Bureau of Public Roads have agreed that any soil having a plasticity index within 2 points of the A-line is to be given a borderline classification. Examples of classifications obtained by this use are ML-CL and SM-SC.

[5] Nonplastic.

TABLE 6.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. Because these in the first column. Interpretations are not given for Gravel pits (Gp) and Quarries (Qu)

Soil series and map symbols	Depth to—		Depth from surface	Classification		
	Bedrock	Seasonal high water table		USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Ayrshire: Ay	>15	1–3	0–16	Fine sandy loam	SM or ML	A–4
			16–44	Sandy clay loam	SC or CL	A–6
			44–60	Fine sand and silt	SM	A–2–4
Brookston: Br	>15	0–1	0–16	Silty clay loam	CL	A–7
			16–44	Clay loam and silty clay loam	CL	A–7, A–6
			44–54	Loam (till)	CL	A–4
Corydon: CoE	1–2	>6	0–7	Stony silt loam	ML or CL	A–4
			7–15	Stony silty clay	CL	A–7
			15	Limestone bedrock.		
*Crosby: CrA, CrB, CsB. For properties of Miami soil in CsB, see Miami series.	>15	1–3	0–11	Silt loam	ML or CL	A–4
			11–34	Clay loam	CL	A–7
			34–45	Loam (till)	CL	A–4
Eel:[2] Ee	>15	3–6	0–30	Silt loam	ML or CL	A–4
			30–42	Loam, silt loam, and sandy loam.	ML or CL	A–4
Fox: FoA, FoB2, FoC2, FoD2, FsA, FxB3, FxC3.	>15	>6	0–13	Loam	CL	A–4
			13–34	Clay loam and gravelly clay loam.	SC or CL	A–7
			34–76	Stratified gravel and sand	SP–SM	A–1
Genesee: Ge	>15	>6	0–26	Loam	ML or CL	A–4
			26–35	Heavy sandy loam or loam	SM or CL	A–4
			35–52	Gravelly loam, loam, and silt loam.	SM	A–2, or A–4
Genesee series, sandy variant:[2] Gn	>15	>6	0–28	Sandy loam	SM	A–2–4 or A–4
			28–52	Heavy sandy loam or loam	SM	A–2–4 or A–4
			52–70	Sand	SP–SM	A–2–4
Hennepin: HeE, HeF	>15	>6	0–10	Loam	CL	A–4
			10–26	Loam (till)	CL	A–4
Kokomo: Ko	>15	0–1	0–13	Silty clay loam	CL	A–7
			13–42	Silty clay and clay	CL or CH	A–7
			42–72	Loam, clay loam, or gravelly clay loam.	ML or CL	A–4 or A–6
Linwood: Lm	>15	0–1	0–30	Muck	Pt	
			30–50	Sandy clay loam	SC	A–6
Martinsville: MaA, MaB2	>15	>6	0–15	Loam	ML or CL	A–4
			15–47	Clay loam	CL	A–6 or A–7
			47–66	Sand, silt, and fine gravel	SM	A–2–4
Medway: Me	>15	3–6	0–18	Silt loam	ML or CL	A–4
			18–36	Loam	CL	A–4
			36–50	Loam and sandy loam	ML	A–4

See footnotes at end of table.

significant in engineering

soils may have different properties and limitations, it is necessary to follow carefully the instructions for referring to other series that appear because these land types have such variable properties. The symbol > means more than]

Percentage passing sieve— No. 10 (2.0 mm.)	Percentage passing sieve— No. 40 (0.42 mm.)	Percentage passing sieve— No. 200 (0.074 mm.)	Permeability	Available moisture capacity	Reaction	Shrink-swell potential
			Inches per hour	*Inches per inch of soil*	*pH value*	
100	70–85	40–55	2. 0–6. 30	0. 12–0. 15	6. 6–7. 0	Low.
100	80–90	35–55	0. 63–2. 0	0. 16–0. 20	5. 4–6. 0	Moderate.
100	70–85	25–35	0. 63–2. 0	0. 14–0. 16	6. 6–7. 3	Low.
100	95–100	85–95	0. 20–0. 63	0. 18–0. 21	6. 6–7. 3	Moderate to high.
100	90–100	70–90	0. 06–0. 20	0. 16–0. 21	6. 6–7. 3	Moderate to high.
100	85–95	60–75	0. 06–0. 20	0. 14–0. 16	(1)	Low.
100	100	95–100	0. 63–2. 00	0. 13–0. 15	6. 6–7. 3	Moderate.
100	100	95–100	0. 20–0. 63	0. 13–0. 15	6. 6–7. 3	Moderate to high.
100	90–100	70–90	0. 63–2. 00	0. 18–0. 22	6. 6–7. 3	Low to moderate.
100	90–100	70–80	0. 06–0. 20	0. 18–0. 21	5. 6–6. 5	Moderate.
100	85–95	60–75	0. 20–0. 63	0. 14–0. 16	(1)	Low to moderate.
100	85–95	60–75	0. 63–2. 00	0. 18–0. 22	(1)	Moderate.
100	70–90	50–75	0. 63–2. 00	0. 14–0. 18	(1)	Moderate.
95–100	85–95	50–75	0. 63–2. 00	0. 16–0. 18	6. 6–7. 3	Low.
70–80	60–70	45–65	0. 63–2. 00	0. 14–0. 17	6. 1–6. 5	Moderate.
60–70	15–30	5–12	>20. 0	0. 02–0. 04	(1)	Low.
100	85–95	60–75	0. 63–2. 00	0. 18–0. 22	(1)	Low.
100	60–70	40–60	0. 63–2. 00	0. 14–0. 16	(1)	Moderate.
90–100	40–70	30–50	0. 63–2. 00	0. 10–0. 14	(1)	Low.
100	60–70	30–40	2. 00–6. 30	0. 08–0. 12	(1)	Low.
100	70–80	30–45	2. 00–6. 30	0. 12–0. 14	(1)	Low.
100	50–70	5–12	6. 30–20. 00	0. 02–0. 04	(1)	Low.
100	85–95	60–75	0. 63–2. 00	0. 16–0. 18	(1)	Moderate.
100	85–95	60–75	0. 63–2. 00	0. 14–0. 18	(1)	Low.
100	95–100	85–95	0. 20–0. 63	0. 19–0. 21	6. 6–7. 3	Moderate.
100	90–100	75–95	0. 06–0. 20	0. 18–0. 22	6. 6–7. 3	Moderate to high.
90–100	85–95	70–90	0. 20–0. 63	0. 14–0. 18	(1)	Moderate.
			6. 30–20. 00	0. 22–0. 26	6. 6–7. 3	Low.
100	30–90	36–50	0. 06–0. 20	0. 14–0. 18	(1)	Moderate.
100	85–95	60–75	0. 63–2. 00	0. 15–0. 19	6. 6–7. 3	Low.
90–100	90–100	70–80	0. 63–2. 00	0. 16–0. 18	5. 6–7. 3	Moderate.
95–100	65–90	15–25	2. 00–6. 30	0. 10–0. 12	(1)	Low.
100	90–100	70–90	0. 63–2. 00	0. 19–0. 23	6. 6–7. 3	Low.
100	85–95	60–75	0. 63–2. 00	0. 15–0. 19	(1)	Moderate.
100	80–95	50–75	0. 63–2. 00	0. 14–0. 17	(1)	Low to moderate.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface	Classification: USDA texture	Classification: Unified	Classification: AASHO
	Feet	*Feet*	*Inches*			
*Miami: MlB2, MlC2, MlD2, MmB3, MmC3, MmD3, MrB. For properties of Crosby soil in MrB, see Crosby series.	>15	>6	0–10	Silt loam	ML or CL	A–4
			10–40	Clay loam	CL	A–7
			40–70	Loam (till)	CL	A–4
Millsdale: Ms	2–3½	0–1	0–34	Silty clay loam	CL or CH	A–7
			34	Limestone bedrock.		
Milton: MtB	2–3½	>6	0–8	Silt loam	ML or CL	A–4
			8–23	Clay loam	CL or CH	A–7
			23–30	Gravelly clay loam	ML or CL	A–6
			30	Limestone bedrock.		
Negley: NeD2, NeE	>15	>6	0–12	Loam	CL	A–4
			12–29	Clay loam	CL	A–6
			29–50	Sandy clay loam	SC or CL	A–6
			50–120	Stratified sandy clay loam and clay loam.	SC or CL	A–6
			120–150	Sand and gravel	SP-SM	A–2–4
Nineveh: NnA, NnB	>15	>6	0–13	Loam	CL, SM–SC	A–4, A–6
			13–36	Gravelly clay loam	SC or CL	A–2 or A–4
			36–54	Gravel and sand	SW–SM	A–1
Ockley: OcA	>15	>6	0–11	Loam	CL	A–4
			11–37	Clay loam	CL, SC	A–7
			37–46	Gravelly clay loam	SC	A–2–6 or A–6
			46–60	Gravel and sand	SP-SM	A–1, A–2–4
Parke: PaB2, PaC2	>15	>6	0–13	Silt loam	ML or CL	A–4
			13–23	Silty clay loam	CL	A–6
			23–52	Clay loam	CL	A–6
			52–120	Stratified sandy clay loam, clay loam, and loam.	SC or CL	A–4
			120–140	Sand and gravel	SP-SM	A–2–4
Princeton: PrA, PrB, PrC	>15	>6	0–12	Fine sandy loam	SM or ML	A–4
			12–38	Sandy clay loam	SC or CL	A–6
			38–47	Sandy loam	SM	A–2–4 or A–4
			47–65	Fine sand	SP-SM	A–3
Randolph: Ra	2–3½	1–3	0–9	Silt loam	ML or CL	A–4
			9–23	Silty clay	CL or CH	A–7
			23–27	Clay	CH	A–7
			27	Limestone bedrock.		

See footnotes at end of table.

significant in engineering—Continued

Percentage passing sieve— No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	Permeability	Available moisture capacity	Reaction	Shrink-swell potential
			Inches per hour	*Inches per inch of soil*	*pH value*	
100	85–95	60–75	0. 63–2. 00	0. 18–0. 22	5. 6–6. 5	Low.
90–100	90–100	70–80	0. 20–0. 63	0. 18–0. 21	5. 1–7. 0	Moderate to high.
90–100	85–95	60–75	0. 20–0. 63	0. 14–0. 18	(1)	Low.
100	95–100	85–95	0. 20–0. 63	0. 19–0. 21	6. 6–7. 3	Moderate to high.
100	85–95	60–75	0. 63–2. 00	0. 18–0. 22	6. 1–6. 5	Low.
90–100	85–95	60–75	0. 63–2. 00	0. 18–0. 21	6. 1–6. 5	Moderate to high.
70–80	55–65	50–60	0. 63–2. 00	0. 14–0. 17	(1)	Moderate.
95–100	85–95	60–75	0. 63–2. 00	0. 14–0. 18	5. 1–5. 5	Low.
100	90–100	70–80	0. 63–2. 00	0. 18–0. 21	4. 5–5. 0	Moderate.
100	80–90	35–55	0. 63–2. 00	0. 14–0. 17	4. 5–5. 0	Moderate.
90–100	80–90	35–60	2. 00–6. 30	0. 10–0. 14	4. 5–7. 3	Low to moderate.
90–100	60–70	6–15	6. 30–20. 00	0. 02–0. 05	(1)	Low.
100	80–90	45–75	0. 63–2. 00	0. 17–0. 20	6. 6–7. 3	Low.
70–80	40–60	30–55	0. 63–2. 00	0. 15–0. 18	6. 6–7. 3	Moderate.
40–60	15–30	5–15	>20. 00	0. 02–0. 05	(1)	Low.
100	85–95	60–75	0. 63–2. 00	0. 17–0. 20	6. 6–7. 3	Low.
100	90–100	45–80	0. 63–2. 00	0. 18–0. 20	5. 1–6. 0	Moderate.
70–80	40–60	30–50	0. 63–2. 00	0. 15–0. 18	(1)	Moderate.
35–70	20–50	5–12	>20. 00	0. 02–0. 05	(1)	Low.
100	90–100	70–90	0. 63–2. 00	0. 18–0. 23	5. 1–6. 0	Low.
100	95–100	85–95	0. 63–2. 00	0. 19–0. 21	5. 1–5. 5	Moderate.
100	90–100	70–80	0. 63–2. 00	0. 18–0. 21	5. 1–5. 5	Moderate.
90–100	80–90	35–60	2. 00–6. 30	0. 14–0. 16	5. 1–6. 5	Low to moderate.
90–100	60–70	5–15	6. 30–20. 00	0. 02–0. 05	(1)	Low.
100	70–85	40–55	2. 00–6. 30	0. 12–0. 16	6. 6–7. 3	Low.
100	80–90	35–55	0. 63–2. 00	0. 14–0. 17	5. 1–5. 5	Moderate.
100	60–70	30–40	2. 00–6. 30	0. 10–0. 14	5. 6–6. 6	Low.
100	70–85	5–10	6. 30–20. 00	0. 04–0. 06	(1)	Low.
100	90–100	70–90	0. 63–2. 00	0. 18–0. 22	6. 6–7. 3	Low.
100	95–100	85–95	0. 20–0. 63	0. 19–0. 21	6. 1–6. 5	Moderate to high.
100	90–100	75–95	0. 20–0. 63	0. 15–0. 18	(1)	Moderate to high.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface	Classification: USDA texture	Classification: Unified	Classification: AASHO
	Feet	*Feet*	*Inches*			
Rensselaer: Re	>15	0–1	0–48	Clay loam	CL	A–7 or A–6
			48–60	Sand, silt, and fine gravel	ML or SM	A–4 or A–2–4
Rodman: RoE	>15	>6	0–13	Gravelly loam	ML	A–4
			13–24	Gravel and sand	SP-SM	A–1–b
Ross: Rt	>15	>6	0–17	Silt loam	ML or CL	A–4
			17–34	Loam	CL	A–4
			34–53	Silt loam	ML or CL	A–4
Ross series, moderately deep variant: Rs.	>15	>6	0–19	Loam	CL	A–2–4 or A–4
			19–30	Gravelly loam	SM	A–4
			30–72	Gravel and sand	SP-SM	A–1–b
Saranac: Sa	>15	0–1	0–19	Silty clay loam	CL	A–6
			19–39	Silty clay	CL or CH	A–7
			39–50	Stratified silt, clay and sand	ML or CL	A–6 or A–4
Sebewa: Se	>15	0–1	0–15	Clay loam	CL	A–6
			15–32	Gravelly clay loam	CL or SC	A–6
			32–60	Gravel and sand	SP-SM	A–1–b
Shoals:[1] Sh	>15	1–3	0–60	Silt loam	ML or CL	A–4
Sleeth: Sm	>15	1–3	0–11	Loam	CL	A–4
			11–32	Clay loam	CL	A–7
			32–48	Gravelly clay loam	ML or CL	A–6
			48–55	Gravel and sand	SP or SM	A–1 or A–2
*Westland: Wc, We. For properties of Brookston soil in We, see Brookston series.	>15	0–1	0–40	Clay loam	CL	A–7
			40–45	Gravelly clay loam	CL or SC	A–6 or A–7
			45–55	Gravel and sand	SP-SM	A–1–b
Whitaker: Wh	>15	1–3	0–19	Loam	CL	A–4
			19–38	Clay loam	CL	A–7
			38–48	Sandy clay loam	SC or CL	A–6
			48–72	Fine sand and silt	SM	A–2–4 or A–4

[1] Moderately alkaline.

significant in engineering—Continued

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
			Inches per hour	*Inches per inch of soil*	*pH value*	
100	90–100	70–80	0. 06–0. 20	0. 18–0. 22	6. 6–7. 3	Moderate.
95–100	65–90	20–60	2. 00–6. 30	0. 12–0. 16	([1])	Moderate to low.
70–80	65–75	50–60	2. 00–6. 30	0. 12–0. 14	([1])	Low.
40–60	15–30	5–12	>20. 00	0. 02–0. 05	([1])	Low.
100	90–100	70–90	0. 63–2. 00	0. 18–0. 23	6. 3–7. 3	Low.
100	85–95	60–75	0. 63–2. 00	0. 16–0. 20	6. 3–7. 3	Moderate.
100	90–100	70–90	0. 63–2. 00	0. 18–0. 22	6. 3–7. 3	Moderate.
90–100	85–95	60–75	2. 00–6. 30	0. 16–0. 20	([1])	Low.
70–80	40–60	30–50	2. 00–6. 30	0. 10 0. 12	([1])	Low.
40–60	15–30	5–12	>20. 00	0. 02–0. 05	([1])	Low.
100	95–100	85–95	0. 20–0. 63	0. 19–0. 21	6. 3–7. 3	Moderate.
100	95–100	90–95	0. 06–0. 20	0. 16–0. 20	6. 3–7. 3	Moderate to high.
100	70–90	50–70	0. 20–0. 63	0. 14–0. 16	([1])	Moderate.
100	90–100	70–80	0. 63–2. 00	0. 18–0. 22	6. 3–7. 3	Moderate to high.
70–80	50–70	40–65	0. 63–2. 00	0. 16–0. 18	6. 3–7. 3	Moderate.
40–60	15–30	5–12	6. 30–20. 00	0. 02–0. 05	([1])	Low.
100	90–100	70–90	0. 63–2. 00	0. 18–0. 22	6. 3–7. 3	Moderate.
100	85–92	60–75	0. 63–2. 0	0. 16–0. 20	6. 6–7. 3	Low.
100	90–100	70–80	0. 63–2. 00	0. 18–0. 21	5. 6–6. 5	Moderate.
70–80	60–80	50–70	2. 00–6. 30	0. 14–0. 17	([1])	Moderate.
50–80	35–70	0–15	6. 30–2. 00	0. 03–0. 04	([1])	Low.
100	90–100	70–80	0. 20–0. 63	0. 18–0. 22	6. 6–7. 3	Moderate to high.
70–80	50–75	40–65	0. 20–0. 63	0. 17–0. 20	([1])	Moderate.
40–60	15–30	5–12	6. 30–20. 00	0. 02–0. 05	([1])	Low.
100	85–95	60–75	0. 63–2. 00	0. 16–0. 20	5. 1–6. 5	Low.
100	90–100	70–80	0. 63–2. 00	0. 18–0. 21	5. 1–5. 5	Moderate to high.
100	80–90	35–55	0. 63–2. 00	0. 14–0. 18	6. 6–7. 3	Moderate.
100	65–90	25–45	2. 00–6. 30	0. 13–0. 16	([1])	Low.

[1] In small areas in the southeastern part of the county, bedrock is at a depth of less than 42 inches.

TABLE 7.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up to two or more kinds of soil. Because these in the first column. Interpretations are not given for Gravel pits (Gp) and Quarries (Qu),

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Ayrshire: Ay	Surface layer fair to good: low organic-matter content. Subsoil fair to poor: low in fertility; somewhat clayey; seasonal high water table at depth of 12 to 36 inches.	Not suitable	Subsoil and substratum fair to poor: moderate shrink-swell potential; fair to good compaction; fair shear strength; moderate frost-heaving potential; seasonal water table at depth of 12 to 36 inches; substratum unstable when saturated.	Seasonal high water table at depth of 12 to 36 inches; modrate frost-heaving potential.
Brookston: Br	Surface layer fair: sticky when wet. Subsoil poor: clayey; seasonal water table at depth of 0 to 12 inches.	Not suitable	Subsoil and substratum poor: medium to high compressibility; moderate to high shrink-swell potential; fair to good compaction characteristics; fair to good stability; seasonal high water table at depth of 0 to 12 inches.	Seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding; moderate to high shrink-swell potential; moderate to high frost-heaving potential; medium to high compressibility.
Corydon: CoE	Very poor: stone fragments throughout; shallow to bedrock; steep slopes.	Not suitable; possible source of limestone for crushing.	Poor: steep slopes; shallow to limestone bedrock.	Steep slopes; shallow to bedrock.
*Crosby: CrA, CrB, CsB. For properties of Miami soil in CsB, see Miami series.	Surface layer fair to good: low in organic matter. Subsoil fair to poor: clayey; low in fertility; seasonal high water table at depth of 12 to 36 inches.	Not suitable	Subsoil poor: moderate shrink-swell potential; medium to high frost-heaving potential; medium to high compressibility.	Seasonal water table at depth of 12 to 36 inches; moderate shrink-swell potential; medium to high compressibility.
Eel: Ee	Surface layer and subsoil good: subject to flooding.	Generally not suitable; isolated pockets of gravel and sand in underlying material.	Subsoil and substratum fair to poor: moderate shrink-swell potential; moderate to high frost-heaving potential; fair compaction characteristics; fair stability; medium compressibility.	Subject to overflow; moderate shrink-swell potential; moderate to high frost-heaving potential; medium compressibility.

engineering properties

soils may have different properties and limitations, it is necessary to follow carefully the instructions for referring to other series that appear because these land types have properties too variable to be rated]

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair to good compaction characteristics; low permeability when compacted; good resistance to piping; fair stability. Substratum: fair to good compaction characteristics; moderate permeability when compacted; poor resistance to piping; fair stability.	Seasonal high water table; seepage through sand seams.	Moderate permeability; seasonal high water table; substratum unstable when saturated.	Not needed except to divert runoff from adjoining higher areas.	Not needed except in areas where a concentrated flow of water comes from adjoining higher areas.	Moderate frost-heaving; potential seasonal high water table at depth of 12 to 36 inches; moderate shrink-swell potential in subsoil.	Severe: seasonal high water table at depth of 12 to 36 inches.
Subsoil and substratum: fair to good compaction characteristics; low permeability when compacted; good resistance to piping; fair to good stability.	Slow seepage; high water table; normally suited to pit ponds.	Slow permeability; seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas.	Not needed except in areas where a concentrated flow of runoff water comes from adjoining higher areas.	Slow permeability; moderate to high shrink-swell potential; medium to high compressibility; seasonal high water table at depth of 0 to 12 inches.	Severe: slow permeability; seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding.
Shallow to bedrock; steep slopes.	Porous limestone bedrock at a depth of less than 24 inches; high seepage potential.	Steep slopes; not needed.	Steep slopes; shallow to bedrock.	Steep slopes; bedrock at a depth of less than 24 inches.	Steep slopes; bedrock at a depth of less than 24 inches.	Severe: steep slopes; limestone bedrock at depth of less than 24 inches.
Subsoil and substratum: fair to good compaction characteristics; low permeability when compacted; good resistance to piping; fair to good stability.	Slow seepage; high water table; normally suited to pit ponds.	Slow permeability; seasonal high water table at depth of 12 to 36 inches; areas of CsB may lack adequate outlets.	No limitations; soil features favorable.	No limitations____	Moderate shrink-swell potential; moderate to high frost-heaving potential; seasonal high water table at depth of 12 to 36 inches.	Severe: slow permeability; seasonal water table at depth of 12 to 36 inches.
Subsoil and substratum: fair compaction characteristics; low permeability when compacted; fair to good resistance to piping; fair stability.	Subject to flooding; moderate to slow seepage rate.	Subject to flooding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas or where overflow water concentrates.	Subject to flooding; moderate shrink-swell potential; moderate to high frost-heaving potential; fair shear strength.	Severe: subject to stream flooding.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Fox: FoA, FoB2, FoC2, FoD2, FsA, FxB3, FxC3.	Surface layer fair to good: may contain a few ½- to 2-inch pebbles. Subsoil fair to poor: somewhat gravelly and clayey; low in fertility.	Good below a depth of 4 feet, except for FsA.	Subsoil poor: fair shear strength; medium compressibility; fair to good compaction characteristics. Substratum very good: slight compressibility; low shrink-swell potential; fair to good shear strength.	Moderate shrink-swell potential; medium compressibility; well-drained side slopes difficult to vegetate.
Genesee: Ge	Surface layer and subsoil good: subject to flooding.	Generally not suitable; some places have sand and gravel in the underlying material.	Subsoil and substratum fair to poor: moderate shrink-swell potential; fair compaction characteristics; moderate to high frost-heaving potential; medium compressibility. Substratum good in places where there is gravel and sand.	Subject to flooding; moderate shrink-swell potential; moderate to high frost-heaving potential; medium compressibility.
Genesee series, sandy variant: Gn.	Surface layer and subsoil fair to poor: sandy; low to moderate available moisture capacity.	Fair to good depending on thickness and amount of sand and gravel in the deposit.	Fair to good: fair to good compactibility, slight compressibility; moderate frost-heaving potential.	Subject to overflow; slight compressibility; moderate frost-heaving potential.
Hennepin: HeE, HeF	Surface layer fair to poor: thin, steep slopes. Subsoil fair to poor: low in organic-matter content and fertility.	Not suitable	Subsoil and substratum fair: moderate shrink-swell potential; medium compressibility; fair to good compaction characteristics.	Steep slopes; cuts and fills needed; moderate shrink-swell potential; medium compressibility.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair to good stability; fair to good compaction characteristics; moderate to high permeability when compacted.	Rapid seepage rate; too sandy and gravelly to hold water.	Not needed; well-drained soil.	Depth to loose gravel and sand is 20 to 42 inches.	Depth to loose gravel and sand is 24 to 40 inches.	Fair shear strength; moderate shrink-swell potential; medium compressibility of the subsoil.	Slight where slopes are 0 to 6 percent: possible pollution of water supplies by effluent. Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 18 percent.
Subsoil and substratum: fair compaction characteristics; low permeability when compacted; fair to good resistance to piping; fair stability.	Subject to flooding; moderate to slow seepage rate.	Not needed; well-drained soil; subject to flooding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas or where overflow water concentrates.	Subject to flooding; moderate shrink-swell potential; slight to medium compressibility.	Severe: subject to stream flooding.
Subsoil and substratum: fair stability; fair to good compaction characteristics; moderate to high permeability when compacted; poor resistance to piping.	Rapid seepage rate; too gravelly and sandy to hold water.	Not needed; well-drained soil; subject to flooding.	Generally not needed.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas or where overflow of water concentrates.	Subject to flooding; poor resistance to piping.	Severe: subject to stream flooding.
Subsoil and substratum: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping.	Slow seepage rate.	Not needed.	Steep slopes	Steep slopes; soil features favorable.	Moderate shrink-swell potential; medium compressibility; steep slopes; fair to good stability; moderate frost-heaving potential.	Severe: steep slopes.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Kokomo: Ko	Surface layer fair: somewhat clayey; sticky when wet. Subsoil poor: clayey; seasonal water table at depth of 0 to 12 inches.	Not suitable on uplands; fair on terraces underlain by sand and gravel; seasonal high water table at depth of 0 to 12 inches.	Subsoil and substratum poor: seasonal high water table at depth of 0 to 12 inches; medium to high compressibility; medium to high shrink-swell potential; fair to poor compaction characteristics; plastic and sticky when wet.	Areas of surface water ponding; seasonal water table at a depth of 0 to 12 inches; medium to high compressibility; medium to high shrink-swell potential.
Linwood: Lm	Poor: erodible; oxidizes rapidly; seasonal water table at depth of 0 to 12 inches.	Not suitable: few isolated deposits of sand in underlying material.	Upper layers not suitable; organic material; high water table at a depth of 0 to 12 inches. Substratum fair to poor: good to fair compaction characteristics; medium to high compressibility.	Organic layer: high compressibility; high frost-heaving potential; seasonal high water table at a depth of 0 to 12 inches; areas of surface water ponding; unstable.
Martinsville: MaA, MaB2	Surface layer good. Subsoil fair: somewhat clayey; low organic-matter content.	Fair to good: range of textures in underlying material.	Subsoil poor: moderate shrink-swell potential; moderate frost-heaving potential; medium to high compressibility. Substratum fair to good: variable textures; fair to good compaction characteristics.	Moderate shrink-swell potential; moderate frost-heaving potential.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair to poor stability; fair to poor compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: in upland position, has similiar characteristics as subsoil; in terrace position, has moderate to high permeability when compacted and fair to poor resistance to piping.	High water table; slow seepage rate; normally suited to pit ponds.	Slow permeability; adequate outlets may be difficult to establish; seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate to high shrink-swell potential; fair to poor shear strength; medium to high compressibility; moderate to high frost-heaving potential; high water table at depth of 0 to 12 inches.	Severe: slow permeability; seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding.
Organic layer: poor stability; poor compaction characteristics; rapid permeability when compacted; poor resistance to piping.	High water table; 12 to 42 inches of organic material; slow seepage in substratum; normally suited to pit ponds.	Organic material subject to subsidence; high water table at a depth of 0 to 12 inches; water may pond on surface; organic material unstable when saturated.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining areas.	Poor stability; high compressibility; high frost-heaving potential; low shrink-swell potential; poor shear strength; high water table at depth of 0 to 12 inches.	Severe: seasonal high water table at a depth of 0 to 12 inches.
Subsoil: fair to good compaction characteristics; low permeability when compacted; fair to good stability; good resistance to piping. Substratum: fair stability; fair to good compaction characteristics; moderate permeability when compacted; poor resistance to piping.	Moderate to rapid seepage rate; sand and silt in substratum.	Not needed; well drained.	Soil features favorable; slopes usually short.	Soil features favorable.	Moderate shrink-swell potential; fair shear strength; moderate frost-heaving potential.	Slight where slopes are 0 to 6 percent: hazard of contaminating nearby water supplies. Moderate where slopes are 6 to 12 percent.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Medway: Me	Surface layer and subsoil good: subject to flooding.	Generally not suited; related pockets of sand and gravel in the underlying material.	Subsoil and substratum fair to poor: moderate shrink-swell potential; moderate to high frost-heaving potential; fair compaction characteristics; fair stability; medium compressibility.	Subject to overflow; moderate shrink-swell potential; moderate to high frost-heaving potential; medium compressibility.
*Miami: MlB2, MlC2, MlD2, MmB3, MmC3, MmD3, MrB. For properties of Crosby soil in MrB, see Crosby series.	Surface layer fair to good: eroded areas somewhat clayey. Subsoil fair to poor: somewhat clayey; low in organic-matter content and fertility.	Not suitable	Subsoil and substratum fair to poor: medium to high compressibility; moderate to high shrink-swell potential; high frost-heaving potential; fair shear strength.	Cuts and fills needed in places; moderate to high shrink-swell potential; medium to high compressibility; high frost-heaving potential.
Millsdale: Ms	Surface layer fair: somewhat clayey; sticky when wet. Subsoil poor: clayey; bedrock at depth of 20 to 40 inches.	Not suitable; possible source of limestone for crushing.	Poor: bedrock at depth of 20 to 40 inches. Subsoil poor: poor to fair compaction characteristics; medium to high compressibility; moderate to high frost-heaving potential; seasonal high water table at a depth of 0 to 1 foot; plastic and sticky when wet.	Bedrock at depth of 20 to 40 inches; moderate to high shrink-swell potential; medium to high compressibility; moderate to high frost-heaving potential; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
Milton: MtB	Surface layer fair to good. Subsoil poor to very poor: clayey; low in organic-matter content; may contain stone fragments; bedrock at depth of 20 to 40 inches.	Not suitable; possible source of limestone for crushing.	Poor: bedrock at depth of 20 to 40 inches. Subsoil poor: medium to high compressibility; moderate to high shrink-swell potential.	Bedrock at depth of 20 to 40 inches; medium to high compressibility; moderate to high frost-heaving potential.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil and substratum: fair stability; fair compaction characteristics; low permeability when compacted; fair to good resistance to piping.	Subject to flooding; moderate to slow seepage rate.	Subject to flooding; moderate permeability.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas or where overflow water concentrates.	Subject to flooding; moderate shrink-swell potential; moderate to high frost-heaving potential; fair shear strength.	Severe: subject to flooding.
Subsoil and substratum: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping.	Slow seepage rate.	Well drained; generally not needed; adequate outlets may be difficult to establish to drain small included wet areas of MrB.	Soil features favorable.	Soil features favorable.	Moderate to high shrink-swell potential; fair shear strength; medium to high compressibility.	Moderate where slopes are 12 percent or less: moderately slow permeability. Severe where slopes are more than 12 percent.
Bedrock at depth of 20 to 40 inches. Subsoil: fair to poor stability; poor to fair compaction characteristics; low permeability when compacted; good resistance to piping; moderate to high shrink-swell potential.	Bedrock at depth of 20 to 40 inches; high water table.	Moderately slow permeability; bedrock at depth of 20 to 40 inches; high water table at depth of 0 to 1 foot; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas; bedrock at depth of 20 to 40 inches.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate to high shrink-swell potential; fair to poor shear strength; medium to high compressibility; moderate to high frost-heaving potential; seasonal high water table at depth of 0 to 1 foot; bedrock at depth of 20 to 40 inches.	Severe: slow permeability; bedrock at depth of 20 to 40 inches; seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding.
Bedrock at depth of 20 to 40 inches. Subsoil: fair stability; fair compaction characteristics; low permeability when compacted; good resistance to piping.	Moderate seepage rate; somewhat porous; limestone bedrock at depth of 20 to 40 inches.	Not needed; well drained; bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches; difficult to maintain grade due to bedrock.	No limitations except bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches; moderate to high shrink-swell potential; fair to poor shear strength; medium to high compressibility; moderate to high frost-heaving potential.	Severe: moderate permeability; limestone bedrock at depth of 20 to 40 inches.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Negley: NeD2, NeE	Surface layer fair to good. Subsoil poor to fair: somewhat clayey and gravelly; low in organic-matter content and fertility.	Fair to good: gravel and sand below depth of 10 or 12 feet.	Subsoil fair: fair to good compaction characteristics; fair stability; moderate to high frost-heaving potential. Substratum good: slight compressibility.	Cuts and fills needed in places; side slopes difficult to vegetate; slight to medium compressibility; moderate to high frost-heaving potential.
Nineveh: NnA, NnB	Surface layer fair to good: contain ½- to 2-inch pebbles in places. Subsoil fair to poor: somewhat gravelly and clayey; low in fertility.	Good below depth of about 3 feet.	Subsoil poor: fair shear strength; medium compressibility; fair to good compaction characteristics. Substratum very good: slight compressibility; low shrink-swell potential; fair to good shear strength.	Moderate shrink-swell potential; medium compressibility; well-drained side slopes; difficult to vegetate.
Ockley: OcA	Surface layer good. Subsoil fair to poor: somewhat clayey and gravelly; low in organic-matter content and fertility.	Good below depth of about 4 feet.	Subsoil poor: fair shear strength; medium compressibility; fair to good compaction characteristics. Substratum very good: slight compressibility; low shrink-swell potential; fair to good shear strength.	Moderate shrink-swell potential; compressibility; well-drained side slopes; difficult to vegetate.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair stability; fair to good compaction characteristics; low permeability; good resistance to piping. Substratum: fair stability; fair to good compaction characteristics; high permeability when compacted; fair to poor resistance to piping.	Moderate to rapid seepage rate.	Not needed; well drained.	Steep slopes	Steep slopes; soil features favorable.	Subsoil: moderate shrink-swell potential; fair to good shear strength; slight to medium compressibility of subsoil; slight compressibility of substratum.	Severe: steep slopes.
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair to good compaction characteristics; moderate to high permeability when compacted.	Rapid seepage rate; too sandy and gravelly to hold water.	Not needed; well drained.	Depth to loose gravel and sand is 24 to 42 inches.	Depth to loose gravel and sand is 24 to 40 inches.	Fair shear strength; moderate shrink-swell potential; medium to high compressibility of the subsoil; slight compressibility of substratum.	Slight: possible pollution of water supplies by effluent.
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair to good stability; fair to good compaction characteristics; moderate to high permeability when compacted.	Rapid seepage rate; too sandy and gravelly to hold water.	Not needed; well drained.	Not needed	Soil features favorable; generally not needed in level area.	Fair shear strength; moderate shrink-swell potential; medium to high compressibility of subsoil; slight compressibility of substratum.	Slight: possible pollution of water supplies by effluent.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Parke: PaB2, PaC2	Surface layer good. Subsoil poor to fair: somewhat clayey; low in organic-matter content and fertility.	Fair to good: gravel and sand below depth of 10 to 12 feet.	Subsoil fair: fair to good compaction characteristics; fair stability; moderate to high frost heaving. Substratum good: slight compressibility.	Cuts and fills needed in places; side slopes difficult to vegetate; slight to medium compressibility; moderate to high frost-heaving potential.
Princeton: PrA, PrB, PrC	Surface layer fair to good: somewhat sandy. Subsoil fair: somewhat clayey; low in organic-matter content and fertility.	Not suitable	Subsoil fair to good: moderate shrink-swell potential; moderate frost-heaving potential; good to fair shear strength. Substratum good: slight compressibility.	Moderate shrink-swell potential in subsoil; slight compressibility; moderate frost-heaving potential; cuts needed in places.
Randolph: Ra	Surface layer fair to good: low in organic-matter content. Subsoil poor: clayey; bedrock at depth of 20 to 40 inches; seasonal high water table at depth of 12 to 36 inches.	Not suitable; possible source of limestone for crushing.	Poor: bedrock at depth of 20 to 40 inches. Subsoil poor: medium to high compressibility; moderate to high shrink-swell potential; seasonal high water table at depth of 12 to 36 inches.	Bedrock at depth of 20 to 40 inches; medium to high compressibility; moderate to high frost-heaving potential.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair stability; fair to good compaction characteristics; low permeability; good resistance to piping. Substratum: fair stability; fair to good compaction characteristics; high permeability when compacted; fair to poor resistance to piping.	Moderate to rapid seepage rate.	Not needed; well drained.	Soil features favorable.	Soil features favorable.	Moderate shrink-swell potential; fair shear strength; medium to high compressibility of subsoil; slight compressibility of substratum.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 12 percent.
Subsoil: fair stability; good to fair compaction characteristics; low permeability when compacted; poor resistance to piping. Substratum: fair stability; good to fair compaction characteristics; moderate permeability when compacted; poor resistance to piping.	Moderate to rapid seepage rate.	Not needed; well drained.	Soil features favorable.	Soil features favorable.	Moderate shrink-swell potential; good to fair shear strength; slight compressibility; moderate frost-heaving potential.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent.
Bedrock at depth of 20 to 40 inches. Subsoil: fair stability; fair compaction characteristics; low permeability when compacted; good resistance to piping.	Limestone bedrock at depth of 20 to 40 inches; high water table at a depth of 12 to 36 inches.	Bedrock at depth of 20 to 40 inches; moderately slow permeability; high water table at depth of 12 to 36 inches.	Not needed except to divert runoff from adjoining higher areas; bedrock at depth of 20 to 40 inches.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas; bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches; moderate to high shrink-swell potential; fair to poor shear strength; medium to high compressibility; moderate to high frost-heaving potential; seasonal high water table at depth of 12 to 36 inches.	Severe: moderately slow permeability; bedrock at depth of 20 to 40 inches; seasonal high water table at depth of 12 to 36 inches.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Rensselaer: Re	Surface layer fair: sticky when wet. Subsoil poor: clayey; seasonal high water table at depth of 0 to 1 foot.	Generally not suitable; a few isolated pockets of sand and gravel.	Subsoil poor: moderate shrink-swell potential; medium to high compressibility; fair shear strength; seasonal high water table at depth of 0 to 1 foot. Substratum fair to poor: fair to good compaction characteristics.	Seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding; moderate shrink-swell potential; moderate to high frost-heaving potential; medium to high compressibility.
Rodman: RoE	Surface layer and subsoil poor to very poor: gravelly.	Good	Subsoil and substratum good: slight compressibility; low shrink-swell potential.	Steep topography; side slopes difficult to vegetate; shallow to loose gravel and sand.
Ross: Rt	Surface layer and subsoil good: subject to flooding.	Generally not suitable; gravel and sand in the underlying material in places.	Subsoil and substratum fair to poor: moderate shrink-swell potential; moderate to high frost-heaving potential; fair compaction characteristics; fair stability; medium compressibility.	Subject to flooding; moderate shrink-swell potential; moderate to high frost-heaving potential; medium compressibility.
Ross series, moderately deep variant: Rs.	Surface layer fair: gravelly in places. Subsoil poor: gravelly.	Good at depth below 2 to 3 feet.	Substratum good: slight compressibility; low shrink-swell potential.	Subject to flooding; slight compressibility.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair stability; fair to good compaction characteristics; moderate permeability when compacted; poor resistance to piping.	High water table; moderate to rapid seepage rate; normally suited to pit ponds that expose the water table.	Slow permeability; seasonal high water table at a depth of 0 to 1 foot; areas of surface water ponding.	Not needed except where concentrated runoff flows from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate shrink-swell potential; medium to high compressibility; fair shear strength; high water table at depth of 0 to 1 foot.	Severe: slow permeability; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
Subsoil and substratum: fair stability; fair to good compaction characteristics; high permeability when compacted; fair resistance to piping.	Rapid seepage rate; too gravelly and sandy to hold water.	Not needed-----	Steep slopes; loose gravel at a depth of less than 20 inches.	Steep slopes; shallow to loose gravel and sand.	Steep slopes; poor stability; low shrink-swell potential; very slight compressibility; low frost-heaving potential.	Severe: steep slopes.
Subsoil and substratum: fair compaction characteristics; low permeability when compacted; fair to good resistance to piping; fair stability.	Subject to flooding; slow seepage rate.	Not needed; well drained.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Subject to flooding; moderate shrink-swell potential; slight to medium compressibility.	Severe: subject to stream flooding.
Subsoil and substratum: fair stability; fair to good compaction characteristics; high permeability when compacted; fair resistance to piping.	Rapid seepage rate; subject to flooding.	Not needed; well drained.	Not needed-----	Generally not needed except where a concentrated flow of water comes from adjoining higher areas; loose gravel at depth below 2 to 3 feet.	Subject to flooding; low shrink-swell potential; fair shear strength; very slight compressibility.	Severe: subject to flooding; possible pollution of water by effluent.

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TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Saranac: Sa	Surface layer fair: sticky when wet. Subsoil poor: clayey; seasonal high water table at depth of 0 to 1 foot.	Generally not suitable; a few isolated pockets of gravel and sand in the underlying material.	Subsoil and substratum poor: high seasonal water table at depth of 0 to 1 foot; fair to poor compaction characteristics; moderate to high shrink-swell potential; plastic and sticky when wet.	Subject to flooding; medium to high compressibility; moderate to high shrink-swell potential; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
Sebewa: Se	Surface layer fair: sticky when wet. Subsoil poor: clayey; gravelly; seasonal high water table at depth of 0 to 1 foot.	Fair to good: variable amount of fines.	Subsoil poor: moderate to high shrink-swell potential; medium to high compressibility; high seasonal water table at depth of 0 to 1 foot.	Seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding; moderate to high shrink-swell potential; moderate to high frost-heaving potential; medium to high compressibility.
Shoals: Sh	Surface layer and subsoil good: underlying material variable; subject to flooding; seasonal high water table.	Generally not suitable; few isolated pockets of gravel and sand in the underlying material.	Subsoil and substratum fair to poor: moderate to high frost-heaving potential; moderate shrink-swell potential seasonal high water table at depth of 0 to 1 foot.	Subject to flooding; moderate shrink-swell potential; medium compressibility; seasonal high water table at depth of 12 to 36 inches.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil and substratum: fair to poor stability; fair to poor compaction characteristics; low permeability when compacted; good resistance to piping.	High water table; subject to flooding; slow seepage rate; normally suited to pit ponds.	Subject to flooding; slow permeability; high water table at depth of 0 to 1 foot; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas or where overflow water concentrates.	Subject to flooding; moderate to high shrink-swell potential; fair to poor shear strength; medium to high compressibility; high water table at depth of 0 to 1 foot.	Severe: slow permeability; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair to good stability; fair to good compaction characteristics; moderate to high permeability when compacted.	Seasonal high water table; substratum has rapid seepage rate; normally suited to pit ponds.	Loose sand and gravel substratum at depth of 24 to 42 inches; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate to high shrink-swell potential; medium to high compressibility; fair shear strength; high water table at depth of 0 to 1 foot.	Severe: seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
Subsoil and substratum: fair compaction characteristics; low permeability when compacted; fair to good resistance to piping; fair stability.	Subject to flooding; high water table; moderate to slow seepage rate; normally suited to pit ponds that expose the water table.	Subject to flooding; high water table at depth of 12 to 36 inches.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas or where overflow water concentrates.	Subject to flooding; moderate shrink-swell potential; moderate to high frost-heaving potential; fair shear strength; seasonal high water table at depth of 12 to 36 inches.	Severe: subject to stream flooding; seasonal high water table at depth of 12 to 36 inches.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Sleeth: Sm	Surface layer fair to good: low in organic-matter content. Subsoil: clayey; low in fertility and organic-matter content; seasonal high water table at depth of 12 to 36 inches.	Good below depth of about 4 feet.	Subsoil fair to poor: moderate shrink-swell potential; good to fair shear strength; moderate frost-heaving potential; seasonal high water table at depth of 1 to 3 feet. Substratum good: may be difficult to use because of the high water table.	Seasonal water table at depth of 12 to 36 inches; moderate shrink-swell potential; moderate frost-heaving potential.
*Westland: Wc, We. For properties of Brookston soil in We, see Brookston series.	Surface layer fair: sticky when wet. Subsoil poor: clayey; somewhat gravelly; seasonal high water table at depth of 0 to 12 inches.	Good below depth of about 4 feet. Areas of We on the uplands are unsuitable.	Subsoil poor: moderate to high shrink-swell potential; medium to high compressibility; fair shear strength; seasonal high water table at depth of 0 to 1 foot. Substratum good: high water table may make it difficult to use.	Seasonal high water table at a depth of 0 to 1 foot; areas of surface water ponding; moderate to high shrink-swell potential; moderate to high frost-heaving potential; medium to high compressibility.
Whitaker: Wh	Surface layer fair to good: low in organic-matter content. Subsoil fair to poor: somewhat clayey; low in fertility and organic-matter content; seasonal high water table at depth of 12 to 36 inches.	Fair for sand: variable textures in underlying material.	Subsoil poor: moderate to high shrink-swell potential; medium to high compressibility; moderate to high frost-heaving potential; seasonal high water table at depth of 12 to 36 inches. Substratum fair to poor: variable textures; fair stability: fair compaction characteristics.	Seasonal high water table at depth of 12 to 36 inches; moderate to high shrink-swell potential; medium to high compressibility; moderate to high frost-heaving potential.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair to good stability; fair to good compaction characteristics; moderate to high permeability when compacted; fair to good resistance to piping.	High water table; rapid seepage rate in substratum; normally suited to pit ponds that expose the water table.	Seasonal high water table at depth of 12 to 36 inches; moderate permeability.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate shrink-swell potential; good to fair shear strength; moderate frost-heaving potential; seasonal high water at depth of 12 to 36 inches.	Severe: seasonal high water table at depth of 12 to 36 inches.
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair to good stability; fair to good compaction characteristics; moderate to high permeability when compacted.	High water table; rapid seepage rate in substratum; normally suited to pit ponds that expose the water table.	Slow permeability; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate to high shrink-swell potential; medium to high compressibility; fair shear strength; high water table at depth of 0 to 12 inches.	Severe: slow permeability; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
Subsoil: fair to good; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair stability; fair compaction characteristics; moderate permeability when compacted; poor resistance to piping.	High water table; rapid seepage rate in substratum; normally suited to pit ponds that expose the water table.	Seasonal high water table at depth of 12 to 36 inches; moderate permeability.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate to high shrink-swell potential; medium to high frost-heaving; potential seasonal high water table at depth of 12 to 36 inches.	Severe: seasonal high water table at depth of 12 to 36 inches.

Engineering interpretations

In table 7 interpretations of soils for engineering uses are given. The data in this table apply to the representative profile of the soil series. The representative profile is described in the section "Descriptions of the Soils."

Some features of a soil may be a help in one kind of engineering work and a hindrance in another. For example, a highly permeable substratum is a feature that would render a soil undesirable as a site for a farm pond. However, it might be favorable for highway location.

Topsoil.—Topsoil refers to soil material, preferably high in organic-matter content, that is used to topdress back slopes, embankments, lawns, gardens, etc. The suitability rating is based mainly on texture and organic-matter content.

Sand and gravel.—The suitability rating applies to the soil material that occurs within a depth of 5 to 7 feet. Sand or sand and gravel occur at variable depths within the same soil series. Test pits are needed to determine the extent and availability of sand or sand and gravel.

Road fill.—The suitability rating is based on performance of soil material if used as borrow for subgrade. Both the subsoil and substratum are rated if they are contrasting in character.

Highway location.—Soil features considered are those that affect overall performance of the soil. The entire profile was evaluated, based on an undisturbed soil without artificial drainage.

Levees and pond embankments.—The features considered are those that affect the use of disturbed soil material for constructing embankments to impound surface water.

Farm pond reservoir areas.—The primary concern is the features of the undisturbed soil that affect the seepage rate (permeability).

Agricultural drainage.—Features are considered which affect the installation and performance of surface and the subsurface drainage practices. Such features are texture, permeability, topography, seasonal water table, and restricting layers.

Terraces and diversions.—Features that affect the layout and construction of terraces and diversions are considered. Such features are topography, texture, and depth to soil material unfavorable to crops.

Grassed waterways.—Features that affect the establishment, growth, and maintenance of vegetation and the layout and construction of grassed waterways are considered.

Foundations for low buildings.—The features and qualities of the undisturbed soils that affect their suitability for foundations of buildings up to three stories high are considered. The substratum of the soil usually provides the base for foundations, therefore this is the soil material evaluated.

Septic tank filter fields.—The factors evaluated are permeability, seasonal water table, flooding hazard, and topography.

Formation and Classification of the Soils

This section lists the factors of soil formation and tells how the main soil-forming processes have interacted to produce the various kinds of soils in Shelby County. It also explains the classification of soils.

Factors of Soil Formation

The factors of soil formation are climate, plant and animal life, parent material, relief, and time. The nature of any soil depends upon the combination of these five major factors. All five of these factors come into play in the formation of every soil, but the relative importance of each differs from place to place.

In extreme cases one factor may dominate the formation of the soil and fix most of its properties, as is common if the parent material consists chiefly of pure quartz sand. Little can happen to quartz sand, and the soils derived from it generally have faint horizons. Even in quartz sand, a distinct profile can be formed under certain types of vegetation if the topography is low and flat and a high water table occurs.

Climate

The climate in Shelby County is midcontinental, and great contrasts in temperature occur. The average daily maximum temperature is 88° F. in July, and the average daily minimum temperature is 23° in January.

Rainfall is moderately heavy, averaging 40.1 inches annually. It is well distributed throughout the year but is slightly greater in spring and summer than in fall and winter. The large amount of rainfall has leached plant nutrients from the surface layer and has kept free calcium carbonate from accumulating.

The climate is so nearly uniform throughout the county that differences among the soils cannot be explained on the basis of differences in climate alone. Climatic forces act upon rocks to form the parent material from which soils are formed, but many of the more important soil characteristics would not develop except for the activity of plant and animal life. Without the changes brought about by plants and animals, the soils would consist merely of residual or transported material derived from weathered rock. In some soils, however, definite layers might form by additions of alluvial or colluvial material resulting from differential weathering or leaching.

Climate, acting alone on the parent material, would be largely destructive. It would cause the soluble material to be washed out of the soils. When combined with the activities of plants and animals, however, the processes of climate become constructive. A reversible cycle is established between the intake and outgo of plant nutrients. Plants draw nutrients from the lower part of the soil profile. When the plants die, the surface soil is renewed by the plant nutrients that are returned to the upper part of the soil.

Plant and animal life

Before this county was settled, the native vegetation was most important in the complex of living organisms that affect soil development. Plants, micro-organisms, earthworms, and other forms of life that live on and in the soil contribute to its morphology. Bacteria and fungi are micro-organisms that affect the soils. They cause raw plant waste to decompose into organic matter and to be incorporated into the soil. The higher forms of plants return organic matter to the soil and bring moisture and plant nutrients from the lower part of the profile to the upper part.

The native vegetation in this county is largely hardwood trees. The most common species are tulip-poplar, oak, hickory, elm, maple, and ash. A comparatively small amount of organic matter from the forest becomes incorporated in the soils while they are forming. In forested areas of uplands that have never been cleared, thin layers of forest litter and leaf mold cover the soils. A small amount of organic matter from decayed leaves and twigs is mixed with the topmost 1 to 2 inches of the surface layer.

In areas of Westland and Brookston soils, the native vegetation included swamp grasses and sedges, as well as water-tolerant trees. These soils were covered with water much of the time, and, as the organic material fell into the water, it decayed slowly and some of it accumulated.

The vegetation is fairly uniform throughout the county. Major differences in the soils, therefore, cannot be explained on the basis of differences in vegetation. Although some comparatively minor variations in the vegetation are associated with different soils, these variations are probably chiefly the result, and not the cause, of the differences in soils.

Relief

The relief of Shelby County ranges from nearly level on the bottom lands, terraces, and upland flats to very steep on the breaks. Most of the county has been somewhat dissected by weathering and by streams. The lowest point in the county is 660 feet above sea level, where Blue River leaves the county. The highest point is 936 feet above sea level, on a hill northeast of Mt. Auburn in Jackson Township. The elevation of the flats in the northeastern part of the county is about 930 feet.

Variations in relief have affected the drainage and development of soils in the county. The influence of relief upon soil formation comes from its controlling effect upon drainage, runoff, and other water effects including normal and accelerated erosion.

In this county differences in relief have radically affected moisture and air conditions within the soils. The profiles of soils that formed in the same type of parent material in steep areas are less strongly developed than those in nearly level to sloping areas. This difference in soil development is caused by (1) rapid normal erosion, (2) reduced percolation of water through the soil material, and (3) lack of water in the soil for the vigorous growth of plants that influence soil formation. The degree of profile development within a given time, on a given parent material, and under the same type of vegetation depends largely on the amount of water that passes through the soil material.

Because of the variation of relief in this county, several different soils have formed from the same kind of parent material. The topographic relationships of selected soil series are illustrated in figure 21.

A good example of the way relief has affected soils that formed in the same kind of parent material is the Miami catena of soils that formed in till. The Crosby soils are nearly level and slowly permeable. The Miami soils are sloping to moderately steep, well drained, brown to dark brown, and moderately slowly permeable. The Hennepin soils, which are very steep, have a less strongly developed profile than the sloping to moderately steep Miami soils. The dark-colored Brookston soils formed in slight depressions.

Time

In Shelby County, generally, the longer the parent material has remained in place the more fully developed the soil profiles are.

Because of differences in parent material, relief, and climate, some soils mature more slowly than others. For example, alluvial soils are immature because the parent materials are young and new materials are deposited periodically. Steep soils are also likely to be immature because geological erosion removes the soil material as fast as it accumulates; also, runoff is greater and less water infiltrates the soil. Some kinds of parent rock are so resistant to weathering that soil development is very slow, even though other conditions are favorable.

A mature soil is one that has well-developed A and B horizons that were produced by the natural processes of soil formation. An immature soil has little or no horizon differentiation. In Shelby County the oldest soils formed from glacial outwash materials of Illinoian age (approximately 240,000 years since the material was deposited). They have well-developed profiles and are considered to be mature or nearly so. Negley and Parke soils formed in outwash of Illinoian age. Most of the soils on terraces and uplands formed in deposits of Wisconsin age drift (deposited 20,000 to 25,000 years ago). Terrace soils are along the streams. These soils generally are not so highly or deeply leached as those that formed in Illinoian outwash and have less strongly developed profiles.

Young soils are generally steep or nearly level. The steep soils, such as those of the Hennepin and Rodman series, are shallow because geologic erosion has removed the soil material about as fast as it has accumulated. The nearly level soils, such as those of the Genesee, Eel, Shoals, Ross, and Medway series are on bottom lands, where they periodically receive fresh deposits of soil material.

Sandy, windblown material was deposited on uplands along streams at about the time of the Wisconsin glaciation. This was the parent material of the well-drained Princeton soils and the somewhat poorly drained Ayrshire soils.

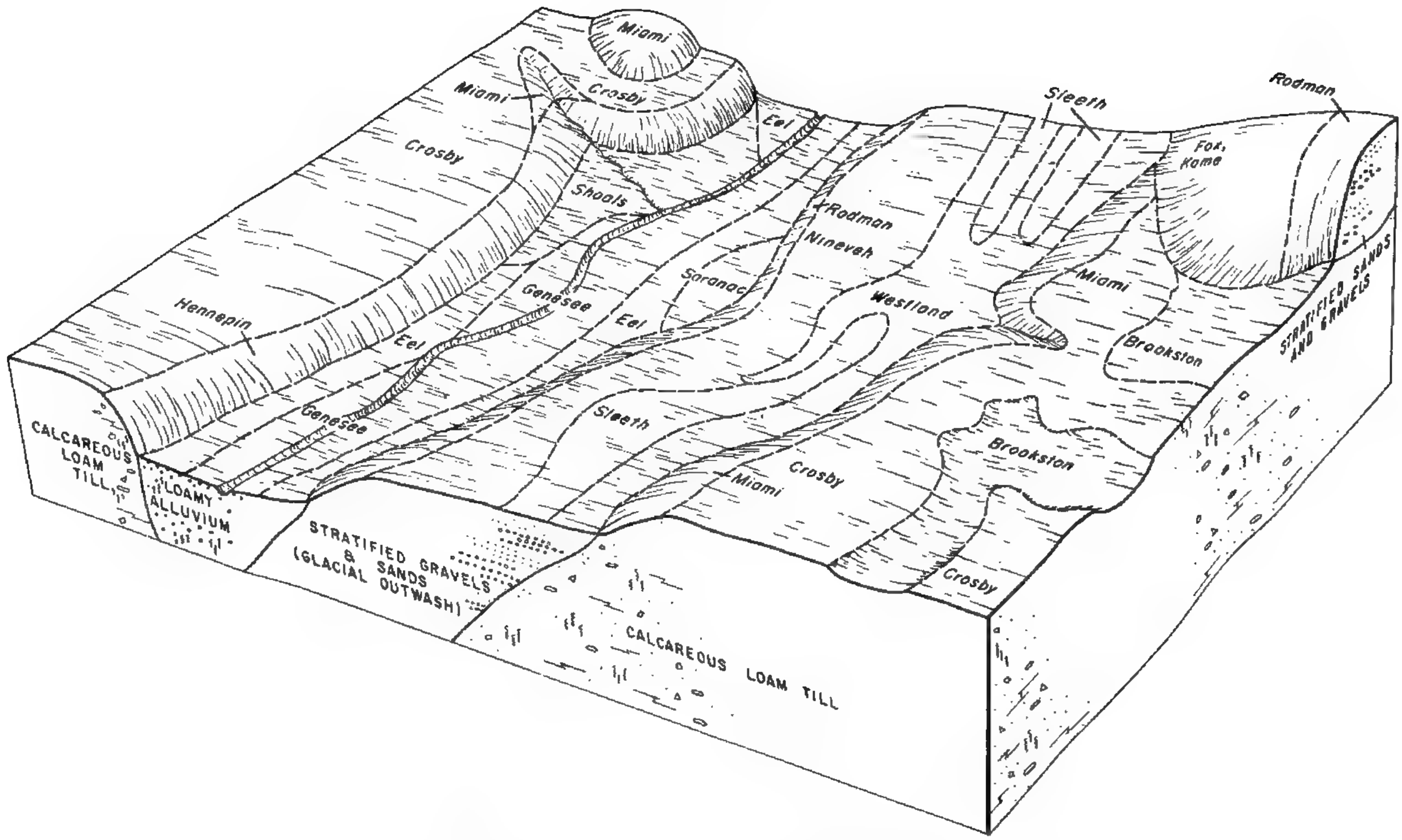

***Figure 21.*—Relationship of soils along the Blue River near Marietta to topography and underlying materials. Diagram shows an alluvial valley, terraces, and gravel-filled kames.**

Parent material

The soils in Shelby County formed in parent material derived from glacial till, or ice-laid material; water-laid deposits, or alluvium; or windblown sand. The underlying bedrock, which is largely limestone, has not had much influence in the development of the soils in this county.

Glaciation has been important in the formation of the soils in Shelby County. Ice sheets, which were hundreds of miles long and thousands of feet thick, covered this county at least three times during periods called glacial stages. From oldest to youngest, these glacial stages were the Kansan, Illinoian, and Wisconsin.

As the ice moved southward, it destroyed old hills and made new ones. Also, the ice and unconsolidated material buried valleys. A mantle of rock, sand, silt, and clay was left when the ice sheets melted or receded. This material, called glacial drift, is till or outwash. The till is compact, heterogeneous sand, silt, clay, and gravel. The outwash is water-laid deposits, mainly sand and gravel.

This county is in central Indiana in the relatively flat upland area called the Tipton Till Plain. Postglacial streams have cut valleys about 20 to 40 feet deep into the glacial drift that underlies this plain. The present landforms in the county are a result of glaciation and minor postglacial erosion. The underlying bedrock has had little effect on the present topography.

Except in part of Jackson Township, the upland soils formed in material that ranges from calcareous loam to light clay loam till. Miami soils developed on gentle slopes and on steep slopes that are along the breaks of rivers and streams. Crosby soils formed in the nearly level areas, Hennepin soils formed in the steep to extremely steep areas, but the dark-colored Brookston soils formed in depressions.

On the high ridges in Jackson Township, some of the soils developed in Illinoian age gravel and sand. This area was partly bypassed by the Wisconsin Glacier. Negley and Parke soils developed here.

In some areas in the southwestern and western parts of the county, the soils formed in windblown sandy deposits. This material is of Wisconsin age and was first deposited in the valleys by glacial melt water. It was then blown out onto the uplands. It ranges in thickness from less than 2 feet to 20 feet or more. Princeton and Ayrshire soils developed in this material.

Soil-forming processes other than glaciation started to work after the glacier retreated northward.

The soils that formed in water-laid material are variable. Some soils formed in outwash that contains a considerable amount of sand and gravel. The outwash was deposited by melt water when the glacier retreated. Different kinds of soils formed in the broad, shallow valleys

that cross the county from northeast to southwest. Glacial streams cut these valleys, and the rapidly flowing water carried along assorted material.

The Fox, Ockley, Sleeth, and Westland soils were derived partly from underlying sand and gravel, but their surface layer appears to have been derived from finer textured material. Some Fox and Rodman soils developed on small isolated knolls, called kames, that occur near Marietta. These kames contain sand and gravel, and they are surrounded by areas of till. Fox soils that have a loamy substratum developed in places where the melt water deposited only a smear of outwash material over the till. Local ponding occurred in places, and the organic Linwood soils developed here.

Only silt and sand were deposited in areas where the water from the glacier decreased in velocity. Whitaker and Rensselaer soils developed in this silt and sand.

On the present flood plains are the Genesee, Eel, Shoals, Saranac, Ross, and Medway soils. These are young soils that formed in alluvium. They receive fresh deposits of alluvium during the frequent floods.

A dry period probably occurred after the glacier retreated, for 0 to 18 inches of loess covers the soils on uplands. In most places, however, this loess is not deep enough to have had much influence on the formation of the soils.

There are limestone outcrops in places, especially along the Flat Rock River. Limestone has also been exposed in several quarries. In other places limestone is close to the surface, but it is covered with glacial drift. Soils that formed in these places are Randolph silt loam and Millsdale soils.

Processes of Soil Formation

Part of the soils in this county were developed by podzolization, the process by which a soil is depleted of bases and develops a leached surface layer. They developed under deciduous forest in a moist, temperate climate.

In podzolization, silicate clays are transferred from an upper to a lower layer by the downward movement of water. The layer immediately below the shallow, organic surface layer becomes leached and lighter colored than the rest of the profile. The clay is carried in suspension by percolating waters until it is deposited in the B horizon.

Other soils in the county were formed by gleization. This process takes place in areas where the parent material is nearly impervious to water or in areas in which water continually stands at or slightly below the surface of the soil. The abundance of water encourages the luxuriant growth of plants. The usual result of gleization is a grayish or bluish layer deep in the soil horizon and mottlings of olive, yellow, brown, and gray along the root channels and cracks in the upper horizons.

Somewhat poorly drained and poorly drained soils in which the ground water is constantly drained away tend to become gray instead of bluish or greenish in the deep part of the substratum. The development of these soils has been affected by both podzolization and gleization.

Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

The system of classifying soils currently used by the National Cooperative Soil Survey was developed in the early sixties (*5*) and was adopted in 1965 (*7*). It is under continual study and revision.

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 8 shows the classification of each soil series of Shelby County by family, subgroup, and order, according to the current system.

Order.—Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different climates. There are five soil orders in Shelby County: Inceptisols, Mollisols, Alfisols, Ultisols, and Histosols.

Inceptisols most often are on young, but not recent, land surfaces. Mollisols generally developed under grass and mixed grass and hardwood vegetation. They have a thick, dark-colored surface layer, moderate to strong structure, and a base saturation of more than 50 percent. Alfisols have a clay-enriched B horizon that is high in base saturation. Ultisols have a clay-enriched B horizon that is low in base saturation. Histosols have a thick organic layer.

Suborder.—Each order is subdivided into suborders, primarily on the basis of those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging or soil differences that result from the climate or vegetation.

Great group.—Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus has accumulated or those that have pans that interfere with growth of roots or movement of water. The features used are the self-mulching properties of clays,

TABLE 8.—*Soil series classified according to the present system of classification*

Series	Current classification		
	Family [1]	Subgroup	Order
Ayrshire	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Brookston	Fine-loamy, mixed, mesic	Typic Argiaquolls	Mollisols.
Corydon	Clayey, mixed, mesic	Lithic Argiudolls	Mollisols.
Crosby [2]	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Eel	Fine-loamy, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols.
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols.
Genesee	Fine-loamy, mixed, mesic	Fluventic Eutrochrepts	Inceptisols.
Genesee, sandy variant	Coarse-loamy, mixed, mesic	Fluventic Eutrochrepts	Inceptisols.
Hennepin	Fine-loamy, mixed, mesic	Typic Eutrochrepts	Inceptisols.
Kokomo	Fine, mixed, mesic	Typic Argiaquolls	Mollisols.
Linwood	Loamy, mixed, euic, mesic	Terric Medisaprists	Histosols.
Martinsville	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Medway	Fine-loamy, mixed, mesic	Fluvaquentic Hapludolls	Mollisols.
Miami	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Millsdale	Fine, mixed, mesic	Typic Argiaquolls	Mollisols.
Milton	Fine, mesic	Typic Hapludalfs	Alfisols.
Negley	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Nineveh	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Argiudolls	Mollisols.
Ockley	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Parke	Fine-silty, mixed, mesic	Typic Hapludults	Ultisols.
Princeton	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Randolph	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Rensselaer	Fine-loamy, mixed, mesic	Typic Argiaquolls	Mollisols.
Rodman	Sandy-skeletal, mixed, mesic	Typic Hapludolls	Mollisols.
Ross	Fine-loamy, mixed, mesic	Cumulic Hapludolls	Mollisols.
Ross, moderately deep variant.	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Cumulic Hapludolls	Mollisols.
Saranac	Fine, mixed, noncalcareous, mesic	Fluventic Haplaquolls	Mollisols.
Sebewa	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Argiaquolls	Mollisols.
Shoals	Fine-loamy, mixed, nonacid, mesic	Aeric Fluventic Haplaquepts	Inceptisols.
Sleeth	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Westland	Fine-loamy, mixed, mesic	Typic Argiaquolls	Mollisols.
Whitaker	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.

[1] The placement of some soil series in the current system, particularly the placement in the families, may change as more precise information becomes available. The classification used here is of April 1968.

[2] Some of the Crosby soils in Shelby County are fine-loamy, mixed, mesic, but this difference does not alter their usefulness and behavior.

soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like.

Subgroup.—Great groups are subdivided into subgroups, one representing the central (typic) segment of the group and others, called intergrades, having properties of the group and also one or more properties of another group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order.

Family.—Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

Series.—The series is a group of soils that have major horizons which, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile.

General Nature of the County

In this section additional information is given about Shelby County. The climate; physiography, relief and drainage; water supply; and farming of the area are briefly discussed.

Shelby County was organized in 1821, 7 years after Indiana was admitted to statehood. Early settlers in the rolling areas and river bottoms found the county covered with great forests of oak, poplar, and walnut. First the river bottoms were cleared. As the county grew and became more urban, the swampy flat uplands were cleared. Farms increased in size but were operated by fewer people. More and more people were commuting to such cities as Indianapolis. By 1960 the population of the county was 35,300.

Shelbyville, the county seat, is the industrial center of Shelby County. It has numerous small and large manufacturing plants and several small industries. The good transportation facilities and closeness to Indianapolis make the county a desirable location for small industries.

Shelby County is well served by railroads and highways. Interstate Highway 74 crosses the county from northwest to southeast and passes close to Shelbyville. Other roads that serve the county are U.S. Highways 421 and 52 and Indiana Highways 44, 9, and 252. The major county roads are blacktop, and the others have gravel surfaces.

The county has a variety of cultural facilities. Most of the major church denominations are represented, as well as several local civic organizations. The 4–H Clubs, Future Farmers of America, and other youth organizations are active. The schools have all been reorganized and consolidated.

Climate [3]

Shelby County has an invigorating climate, with four well-defined seasons of the year, because of its location in the middle latitudes and in the interior of a continent away from the moderating effect of oceans. Air currents of both tropical and polar origin cause frequent changes of temperature and humidity and near-ideal rainfall. Low-pressure centers from the west cross the plains and move up the Ohio River Valley and the St. Lawrence River Valley to the Atlantic. Most rainfall comes from these storms. Scattered thunderstorms are the primary source of summer rainfall. These storms occur on an average of about 47 days a year. About one a year occurs during winter. Severe storms are rare, but 11 tornadoes have been reported in the county in the 50-year period of 1916 to 1967.

Data on temperature and precipitation are given in table 9. Table 10 gives probable dates for the first and last freezing temperatures of the year (*4*). In July, the warmest month of the year, the temperature reaches 90° F. or higher on an average of 13 days. The winter season averages 4 days with temperatures below zero. January is usually the coldest month of the year.

Precipitation is usually greatest late in spring and early in summer. The winter months average a little less than 3 inches, and the spring months, a little less than 4 inches. April and May each average 8 days that have 0.10 inch or more of rain. The number of days drops to five late in summer and in winter. Drought is infrequent but does affect farming occasionally.

Extreme rainfall of 1.7 inches in 1 hour occurs about once in 5 years. A rain of 2.1 inches in 1 hour occurs about once in 10 years; and a rainfall of 2.4 inches in 1 hour, about once in 25 years. In any 6-hour period, a rainfall of 4.0 inches occurs about once in 25 years and a rainfall of 3.3 inches, once in 10 years.

Snowfall has occurred as early as October and as late as May. The annual total averages 14 inches. In 1 day it has snowed as much as 7.5 inches. Many winter cold periods are preceded by snowfall, which protects over-wintering crops from extreme temperatures.

Relative humidity varies on an average summer day from the 40's during a typical summer afternoon to 90 or higher just before dawn. Relative humidity rises and falls much as temperature does during a 24-hour period, but the highest humidity generally occurs along with a minimum temperature, and the lowest, with the maximum temperature. In winter the most probable range of relative humidity is from the 60's to the 90's. Southerly winds bring higher humidities than northerly winds.

Prevailing winds are from the southwest during the year, except in winter, when they are predominantly from the west and northwest. Velocities 20 feet above the ground average about 12 miles an hour in spring and near 7 miles per hour late in summer. Winds are stronger during daylight hours than at night.

Most ideal weather for outdoor activities comes in the fall, when temperatures are regularly in the comfortable range, showers are minimal, and sunshine averages about 70 percent of the maximum possible amount.

Water Supply

The water supply for industry and homes comes mainly from wells. Shelby County's best sources of water are the terraces underlain by gravel. Shelbyville gets its water supply from wells in the terraces along Blue River. In places irrigation water is pumped from pits 8 to 10 feet deep in the low gravel terraces that have a high water table. Depth to water in the uplands depends on the thickness and composition of the till. Most water comes from gravel strata within the till. In some parts of the county, the till is relatively thin over limestone. In these areas, the wells extend into the stone and are not so reliable a source of water as those in the deeper till areas.

Physiography, Relief, and Drainage

Shelby County is located in the Tipton Till Plain (*2*), which occupies most of the central part of Indiana and forms part of the central Lowland Province of the United States (*9*). This whole area is characterized by only small differences in relief, for it has been only slightly changed by the post-Wisconsin streams. Glaciation, and not the underlying bedrock, was the principal factor responsible for the present landforms.

In this county, topography is rather level, except for the breaks along streams, kames near Marietta, and high hills in Jackson Township. The Bloomington Moraine crosses the northern part of the county but does not have any extreme variations of elevation. The kames near Marietta are prominent features on the landscape. They are gravel-filled hills left by the melting Wisconsin Glacier. The high ridges in Jackson Township appear to be remnants of an outwash plain of Illinoian age. It has been reworked somewhat by the Wisconsin Glacier scraping along the sides and, in places, riding up over the top of the ridges. In part of the area the Illinoian age material is exposed, and in other places it is covered by only a few feet of Wisconsin age till.

The Blue River cuts diagonally across Shelby County from the northeastern corner to the southwestern corner. The county generally slopes from northeast to southwest. Blue River is the major drainage system in the county. It is fed by Brandywine Creek, which drains the north-central part of the county, and by Little Blue River, which drains the northeastern part. The other two main drainage systems in Shelby County are Sugar Creek and

[3] By LAWRENCE A. SCHAAL, climatologist for Indiana, National Weather Service, U.S. Department of Commerce.

TABLE 9.—*Temperature and precipitation data*

[All data from Shelbyville, Shelby County, Indiana]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Average monthly maximum	Average monthly minimum	Average monthly total	1 year in 10 will have— Less than—	1 year in 10 will have— More than—	Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover of 1 inch or more
	° F.	° F.	° F.	° F.	Inches	Inches	Inches	Number	Inches
January	40	23	61	−1	3.1	0.8	8.0	4	2
February	43	25	63	3	2.5	.6	4.6	3	3
March	52	32	74	13	3.7	1.4	7.7	1	2
April	64	42	83	26	3.9	1.4	7.1	0	0
May	75	52	89	36	4.2	1.5	7.7	0	0
June	85	62	95	46	3.9	1.1	7.0	0	0
July	88	64	97	52	3.8	1.1	6.3	0	0
August	87	63	96	49	3.3	1.7	5.8	0	0
September	80	55	93	38	3.5	.9	7.0	0	0
October	69	45	85	28	2.3	.5	4.5	0	0
November	52	33	73	15	3.2	1.3	6.4	(1)	2
December	41	25	62	3	2.7	.8	5.1	5	3
Year	65	47	[2] 99	[3] −6	40.1	30.7	50.4	13	2

[1] Less than one-half day.
[2] Average annual maximum.
[3] Average annual minimum.

TABLE 10.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data from Shelbyville, Shelby County, Indiana]

Probability	Date for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	March 26	April 2	April 14	April 26	May 14
2 years in 10 later than	March 19	March 27	April 8	April 20	May 8
5 years in 10 later than	March 4	March 14	March 26	April 8	April 26
Fall:					
1 year in 10 earlier than	November 11	November 6	October 27	October 11	September 30
2 years in 10 earlier than	November 19	November 12	October 31	October 16	October 6
5 years in 10 earlier than	December 5	November 24	November 10	October 28	October 18

Flatrock River. Sugar Creek drains the western part of the county, and Flatrock River drains the southeastern and south-central part. Flatrock River has two major tributaries, Conns Creek and Lewis Creek.

Farming

Shelby County is one of the important farming counties in Indiana. Farming is generally of the cash-grain and livestock type. The following statistics are from the census of agriculture.

In 1964 there were 233,040 acres, or 89 percent, of the land in farms, a decrease from 234,689 acres, or 89.7 percent, in 1959. In 1964 there were 1,298 farms, a decrease from 1,586 farms in 1959. The size of the farms is increasing, from an average of 148.0 acres in 1959 to 179.5 acres in 1964. The average value per acre increased from $342.73 in 1959 to $413.52 in 1964.

The types of farms are changing somewhat. In 1959 there were 410 miscellaneous and unclassified farms, and in 1964 there were 294. During that period, the number of general farms decreased from 110 to 52. The average number of livestock farms, other than poultry and dairy, was 541 in 1959 and 284 in 1964. Dairy farms numbered 160 in 1959 and 123 in 1964. Cash-grain farms showed an increase in number from 410 in 1959 to 530 in 1964.

Corn is grown on more acres than any other crop, but soybean acreage is also extensive. In 1964, 71,423 acres of corn were harvested for grain and 45,352 acres were in soybeans. Small grain was grown on 27,823 acres.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Calcareous soil. A soil that contains enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Catena. A sequence, or "chain," of soils on a landscape, that developed from one kind of parent material but have different characteristics because of differences in relief and drainage.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" if rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour or are parallel to terraces or diversions. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect downslope areas from the effects of such runoff.

Drainage, natural. Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and in podzolic soils commonly have mottlings below a depth of 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be lacking or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Drift (geology). Material of any sort deposited by geologic processes in one place after having been removed from another; includes drift materials deposited by glaciers and by streams and lakes associated with them.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when such other growth factors as light, moisture, temperature, and the physical condition of the soil are favorable.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active, and, therefore, it is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Immature soil. A soil that lacks clearly defined horizons because the soil-forming forces have acted on the parent material only a relatively short time since it was deposited or exposed.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Loess. A fine-grained eolian deposit that consists dominantly of silt-sized particles.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineralogical, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Organic soil. A general term applied to a soil or to a soil horizon that consists primarily of organic matter, such as peat soils, muck soils, and peaty soil layers. In chemistry, organic refers to the compounds of carbon.

Parent material. The disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction, because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, the individual rock or mineral fragments in soils that have diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. As a soil textural class, soil material that contains 85 percent or more sand and not more than 10 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips, or bands, to serve as vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Subsurface layer. A term used in nontechnical soil descriptions for a leached layer between the surface soil and the subsoil.

Surface layer. A term used in nontechnical soil descriptions for one or more layers above the subsoil. Includes A horizon and part of B horizon; has no depth limit.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, that borders a river, a lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to flooding. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportions of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Upland (geology). Land that consists of material unworked by water in recent geologic times and lying, in general, at a higher elevation than the alluvial plain or stream terrace; land above the lowlands along rivers.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs. In referring to a capability unit, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Acreage and extent of soils, table 1, p. 9.
Predicted yields, table 2, p. 48.
Use of soils for wildlife, table 3, p. 49.
Use of soils for recreation, table 4, p. 52.
Engineering uses of the soils, tables 5, 6, and 7, pp. 58 through 83.

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page
Ay	Ayrshire fine sandy loam	9	IIw-2	42
Br	Brookston silty clay loam	10	IIw-1	42
CoE	Corydon stony silt loam, 18 to 35 percent slopes	10	VIIe-2	46
CrA	Crosby silt loam, 0 to 2 percent slopes	12	IIw-2	42
CrB	Crosby silt loam, 2 to 4 percent slopes	12	IIe-12	41
CsB	Crosby-Miami silt loams, 0 to 6 percent slopes	12	IIe-12	41
Ee	Eel silt loam	13	I-2	40
FoA	Fox loam, 0 to 2 percent slopes	14	IIs-1	43
FoB2	Fox loam, 2 to 6 percent slopes, eroded	14	IIe-9	40
FoC2	Fox loam, 6 to 12 percent slopes, eroded	14	IIIe-9	44
FoD2	Fox loam, 12 to 18 percent slopes, eroded	15	IVe-9	46
FsA	Fox loam, loamy substratum, 0 to 3 percent slopes	15	IIs-1	43
FxB3	Fox clay loam, 2 to 6 percent slopes, severely eroded	15	IIIe-9	44
FxC3	Fox clay loam, 6 to 12 percent slopes, severely eroded	15	IVe-9	46
Ge	Genesee loam	16	I-2	40
Gn	Genesee sandy loam, sandy variant	16	IIs-6	44
Gp	Gravel pits	17	VIIIs-2	46
HeE	Hennepin loam, 18 to 25 percent slopes	17	VIIe-2	46
HeF	Hennepin loam, 25 to 50 percent slopes	17	VIIe-2	46
Ko	Kokomo silty clay loam	18	IIw-1	42
Lm	Linwood muck	19	IIw-10	43
MaA	Martinsville loam, 0 to 2 percent slopes	19	I-1	39
MaB2	Martinsville loam, 2 to 6 percent slopes, eroded	19	IIe-1	40
Me	Medway silt loam	20	I-2	40
MlB2	Miami silt loam, 2 to 6 percent slopes, eroded	21	IIe-1	40
MlC2	Miami silt loam, 6 to 12 percent slopes, eroded	21	IIIe-1	44
MlD2	Miami silt loam, 12 to 18 percent slopes, eroded	21	IVe-1	46
MmB3	Miami clay loam, 2 to 6 percent slopes, severely eroded	22	IIIe-1	44
MmC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	22	IVe-1	46
MmD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	22	VIe-1	46
MrB	Miami-Crosby silt loams, 0 to 6 percent slopes	22	IIe-1	40
Ms	Millsdale silty clay loam	23	IIIw-5	45
MtB	Milton silt loam, 1 to 6 percent slopes	24	IIIe-8	44
NeD2	Negley loam, 12 to 18 percent slopes, eroded	25	IVe-9	46
NeE	Negley loam, 18 to 25 percent slopes	25	VIe-1	46
NnA	Nineveh loam, 0 to 2 percent slopes	25	IIs-1	43
NnB	Nineveh loam, 2 to 6 percent slopes	25	IIe-9	40
OcA	Ockley loam, 0 to 2 percent slopes	27	I-1	39
PaB2	Parke silt loam, 2 to 6 percent slopes, eroded	27	IIe-1	40
PaC2	Parke silt loam, 6 to 12 percent slopes, eroded	28	IIIe-1	44
PrA	Princeton fine sandy loam, 0 to 2 percent slopes	28	IIs-5	44
PrB	Princeton fine sandy loam, 2 to 6 percent slopes	28	IIe-11	40
PrC	Princeton fine sandy loam, 6 to 12 percent slopes	28	IIIe-15	45
Qu	Quarries	29	VIIIs-2	46
Ra	Randolph silt loam	30	IIIw-7	45
Re	Rensselaer clay loam	31	IIw-1	42
RoE	Rodman gravelly loam, 18 to 35 percent slopes	31	VIIs-1	46
Rs	Ross loam, moderately deep variant	33	IIs-6	44
Rt	Ross silt loam	32	I-2	40
Sa	Saranac silty clay loam	33	IIIw-9	45
Se	Sebewa clay loam	34	IIw-4	42
Sh	Shoals silt loam	35	IIw-7	42
Sm	Sleeth loam	36	IIw-2	42
Wc	Westland clay loam	37	IIw-1	42
We	Westland and Brookston loams, overwash	37	IIw-1	42
Wh	Whitaker loam	38	IIw-2	42

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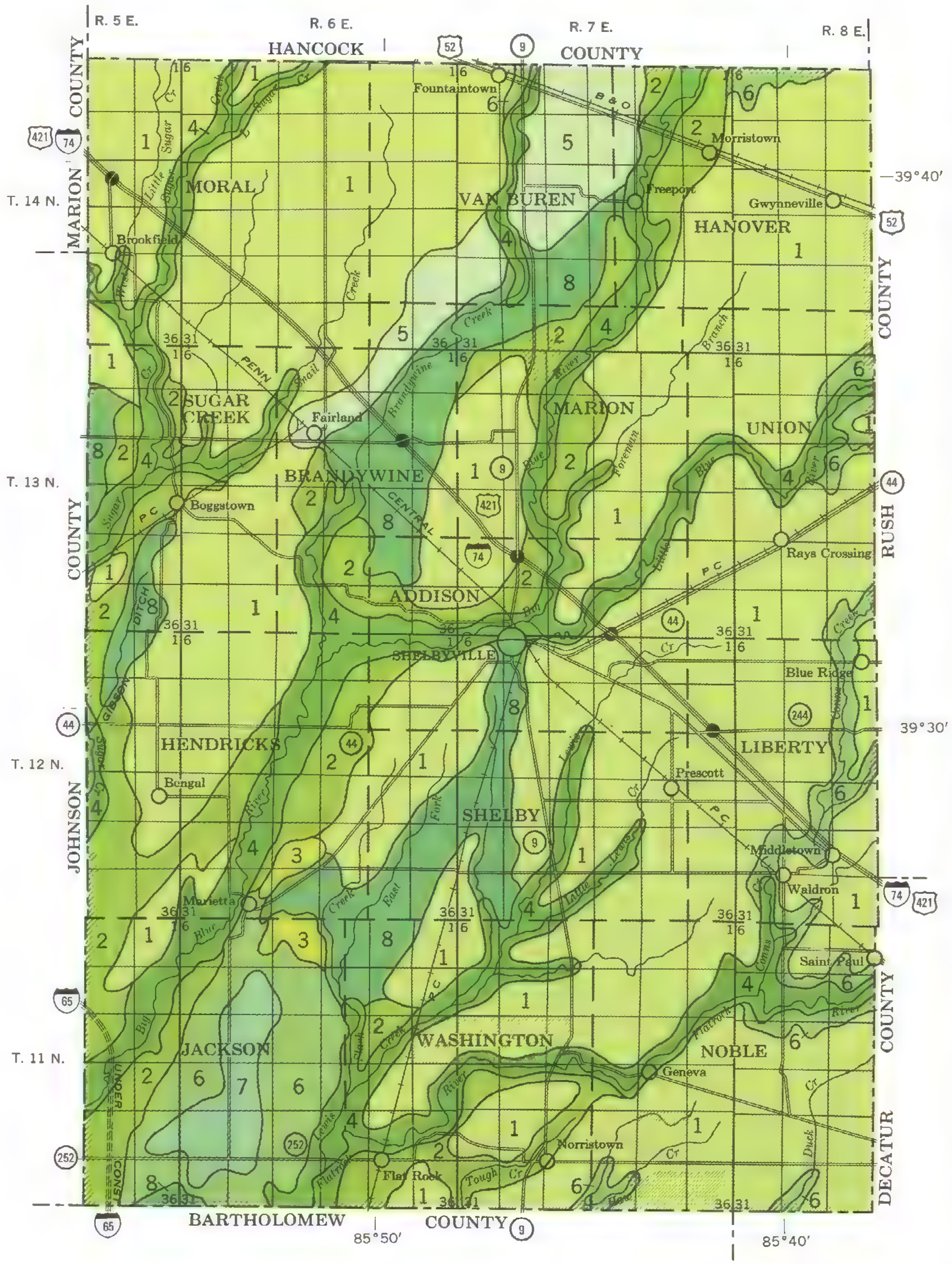


U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

SHELBY COUNTY, INDIANA

Scale 1: 190,080

1 0 1 2 3 4 Miles

N

SOIL ASSOCIATIONS*

1 Crosby-Brookston association: Deep, somewhat poorly drained and very poorly drained, nearly level and gently sloping, medium-textured and moderately fine textured soils; on uplands

2 Fox-Nineveh-Ockley association: Well-drained, nearly level to gently sloping, medium-textured soils that are moderately deep and deep over gravel and sand; on terraces

3 Fox-Rodman association: Well-drained, moderately steep and steep, medium-textured and moderately coarse textured soils that are moderately deep to shallow over gravel and sand; on kames

4 Genesee-Ross-Shoals association: Deep, well-drained and somewhat poorly drained, nearly level, medium-textured soils; on flood plains

5 Miami-Crosby association: Deep, well-drained and somewhat poorly drained, nearly level to rolling, medium-textured soils; on uplands

6 Miami-Crosby-Hennepin association: Deep, well-drained and somewhat poorly drained, nearly level to steep, medium-textured soils; on uplands

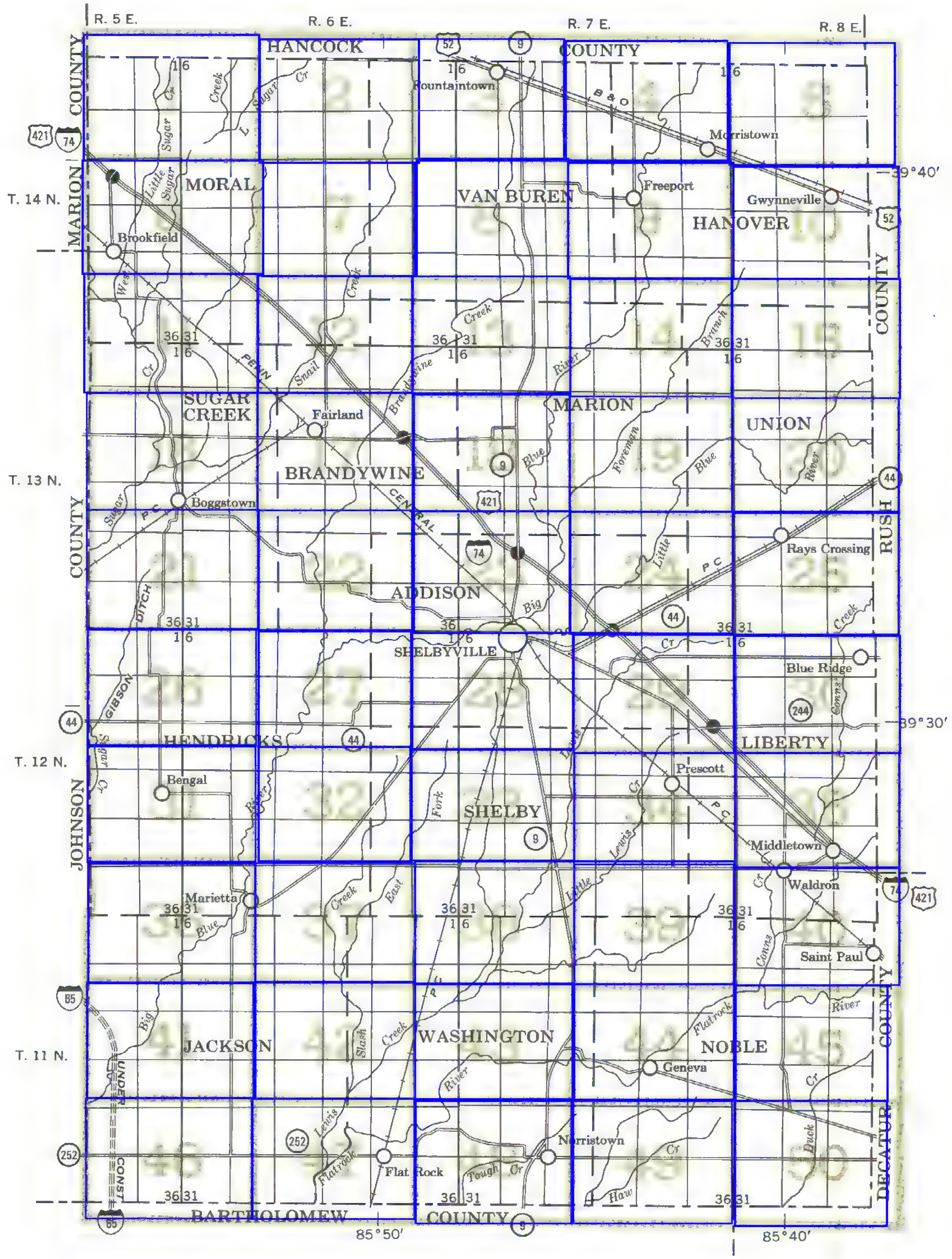
7 Parke-Miami-Negley association: Deep, well-drained, gently sloping to steep, medium-textured soils; on uplands and terraces

8 Westland-Sleeth association: Deep, very poorly drained and somewhat poorly drained, nearly level, moderately fine textured and medium-textured soils; on glacial outwash plains and on terraces

*Texture refers to surface layer in major soils of each association.

Compiled 1972

This map is for general planning. It shows only the major soils and does not contain sufficient detail for operational planning.



INDEX TO MAP SHEETS

SHELBY COUNTY, INDIANA

Scale 1:190,080

1 0 1 2 3 4 Miles

N

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Most symbols without a slope letter are for nearly level soils, but some are for land types that have a considerable range in slope. A final number, 2 or 3, in a symbol shows that the soil is named as eroded or severely eroded.

SYMBOL	NAME
Ay	Ayrshire fine sandy loam
Br	Brookston silty clay loam
CoE	Corydon stony silt loam, 18 to 35 percent slopes
CrA	Crosby silt loam, 0 to 2 percent slopes
CrB	Crosby silt loam, 2 to 4 percent slopes
CsB	Crosby-Miami silt loams, 0 to 6 percent slopes
Ee	Eel silt loam
FoA	Fox loam, 0 to 2 percent slopes
FoB2	Fox loam, 2 to 6 percent slopes, eroded
FoC2	Fox loam, 6 to 12 percent slopes, eroded
FoD2	Fox loam, 12 to 18 percent slopes, eroded
FsA	Fox loam, loamy substratum, 0 to 3 percent slopes
FxB3	Fox clay loam, 2 to 6 percent slopes, severely eroded
FxC3	Fox clay loam, 6 to 12 percent slopes, severely eroded
Ge	Genesee loam
Gn	Genesee sandy loam, sandy variant
Gp	Gravel pits
HeE	Hennepin loam, 18 to 25 percent slopes
HeF	Hennepin loam, 25 to 50 percent slopes
Ko	Kokomo silty clay loam
Lm	Linwood muck
MaA	Martinsville loam, 0 to 2 percent slopes
MaB2	Martinsville loam, 2 to 6 percent slopes, eroded
Me	Medway silt loam
MlB2	Miami silt loam, 2 to 6 percent slopes, eroded
MlC2	Miami silt loam, 6 to 12 percent slopes, eroded
MlD2	Miami silt loam, 12 to 18 percent slopes, eroded
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MtB	Milton silt loam, 1 to 6 percent slopes
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Qu	Quarries
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Re	Rensselaer clay loam
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Sa	Saranac silty clay loam
Se	Sebewa clay loam
Sh	Shoals silt loam
Sm	Sleeth loam
Wc	Westland clay loam
We	Westland and Brookston loams, overwash
Wh	Whitaker loam

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Divided
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Buildings
- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches

Lakes and ponds
- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments
- Bedrock
- Other

Short steep slope

Prominent peak

Depressions (Large / Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

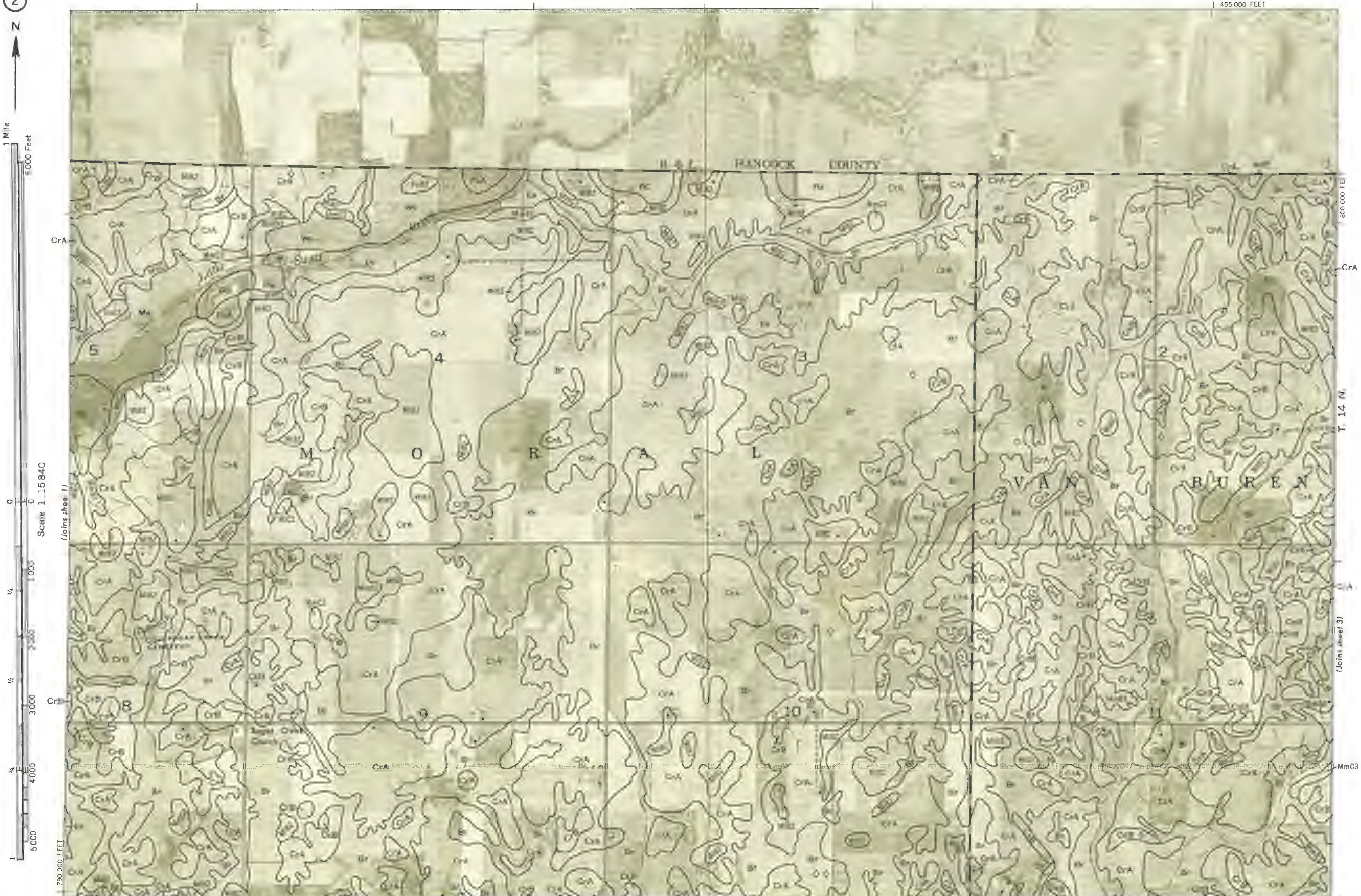
SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness: Stony; Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Borrow pit (B.P.)
- Area of Crosby soil ½ acre to 3 acres

SHELBY COUNTY, INDIANA — SHEET NUMBER 1

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone



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SHELBY COUNTY, INDIANA — SHEET NUMBER 4

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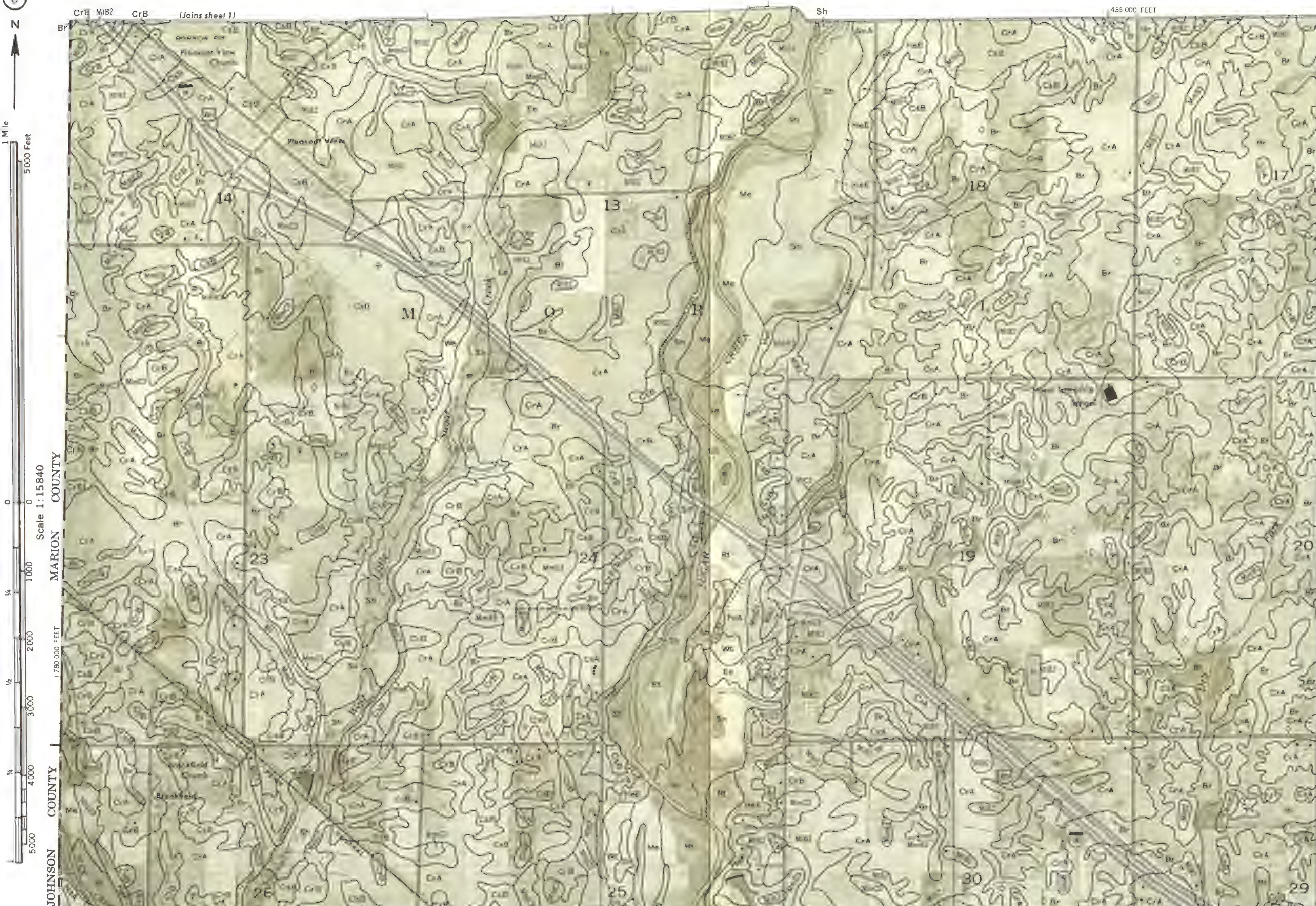
SHELBY COUNTY, INDIANA — SHEET NUMBER 6



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Land division corners are approximately positioned on this map

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

SHELBY COUNTY, INDIANA — SHEET NUMBER 8

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land divisions on corners are approximately positioned on this map.

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SHELBY COUNTY, INDIANA — SHEET NUMBER 9

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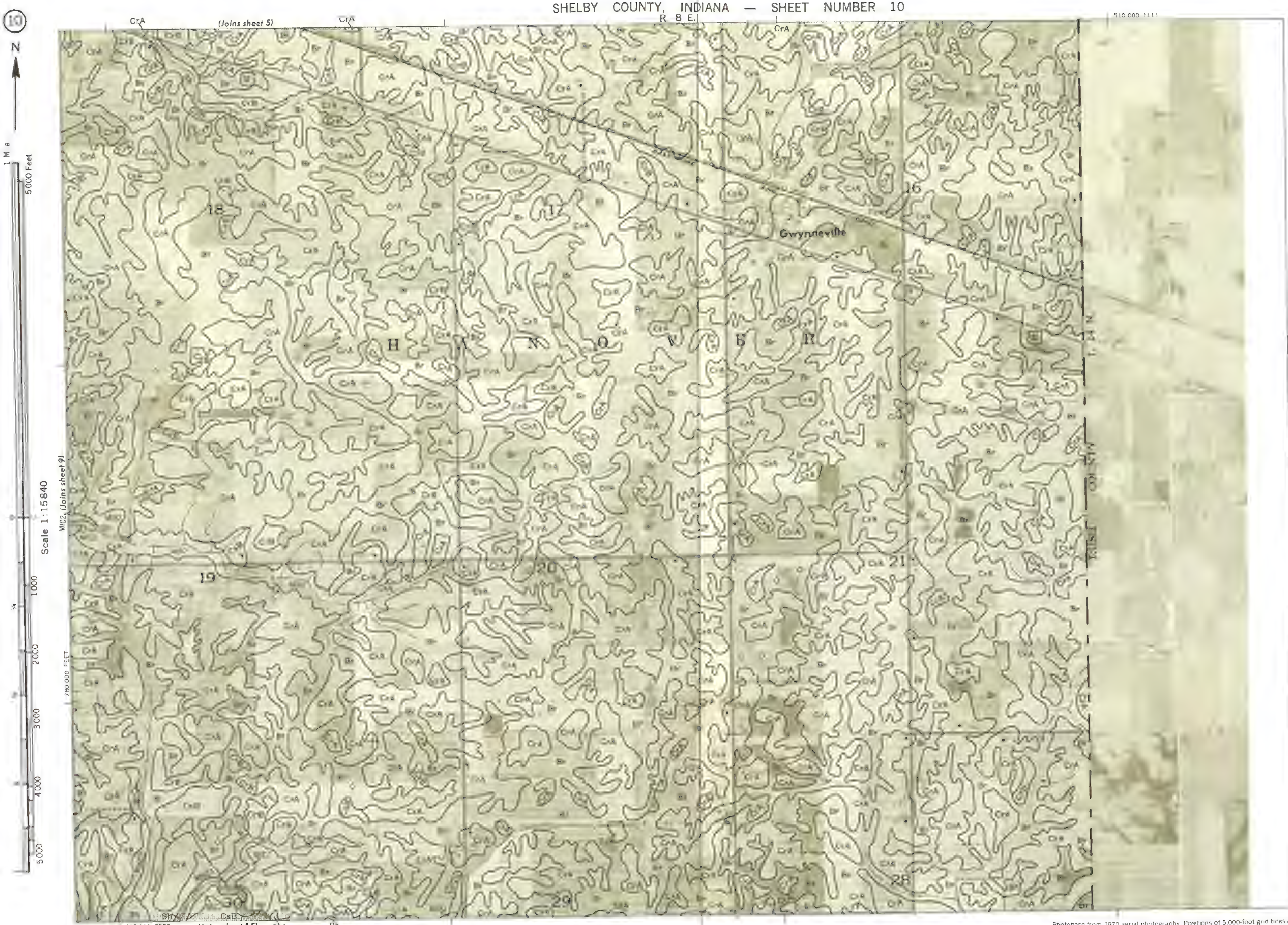
Land divisions on corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.



Land division corners are approximately positioned on this map

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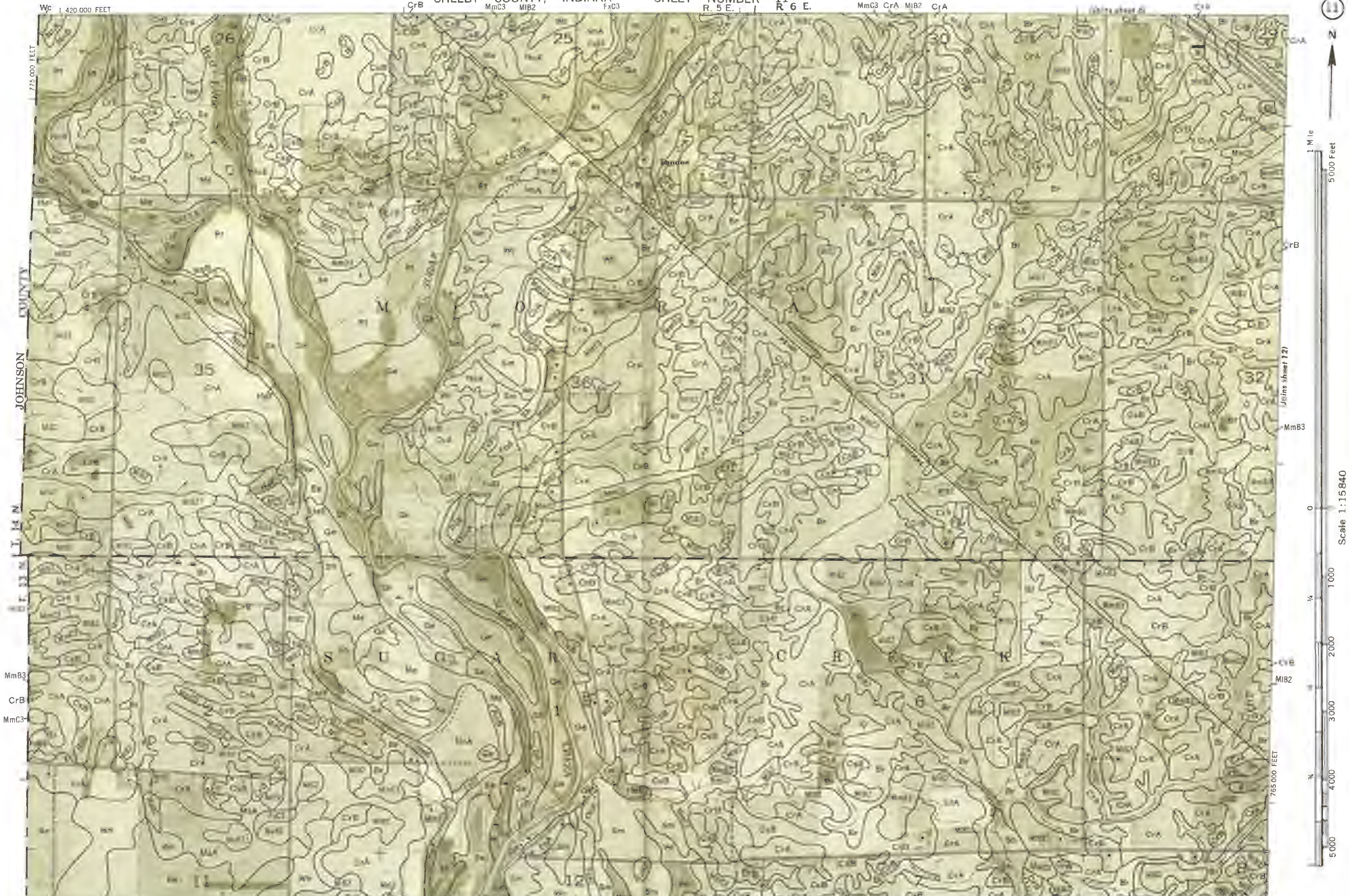
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

SHELBY COUNTY, INDIANA — SHEET NUMBER 11



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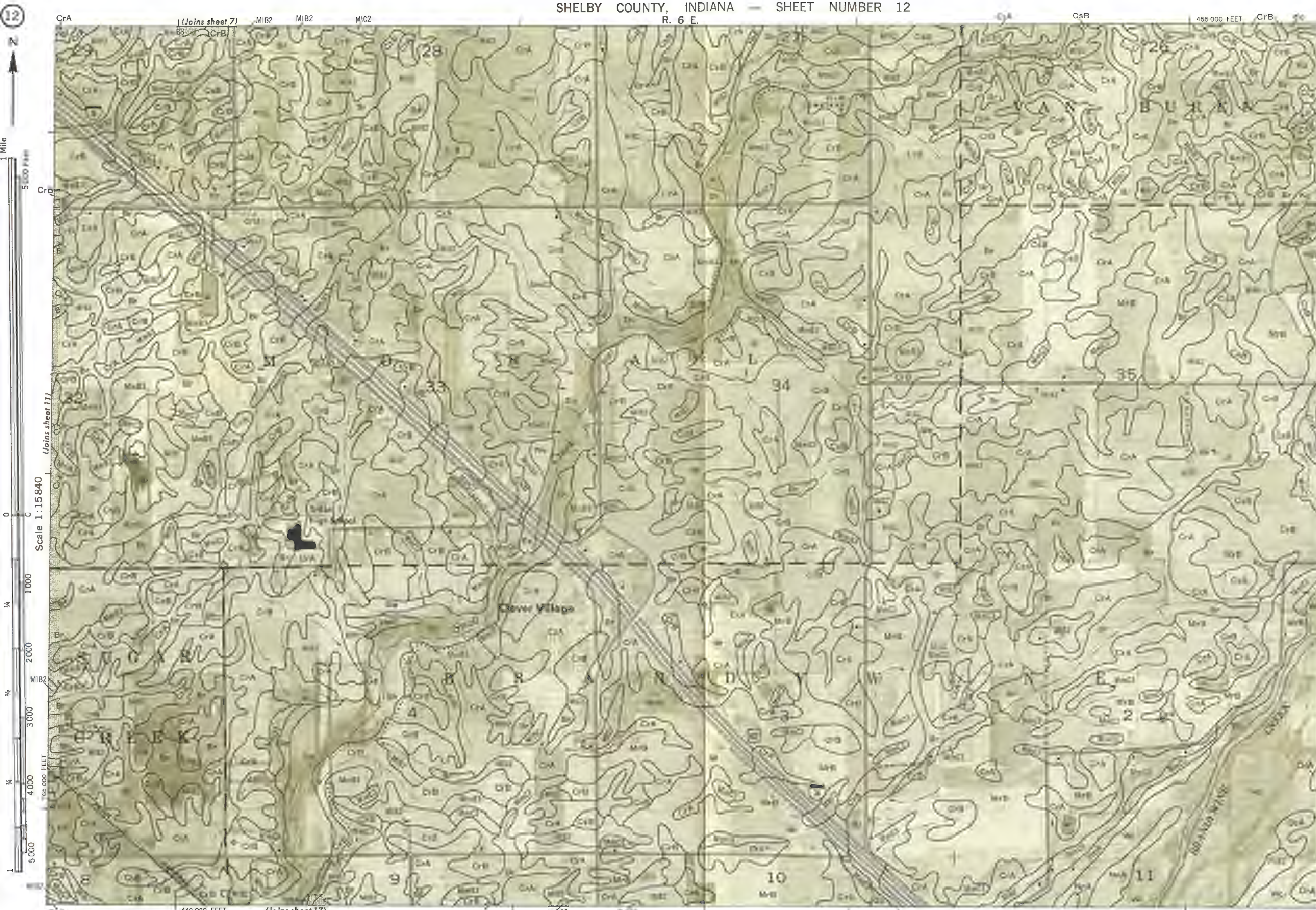
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

SHELBY COUNTY, INDIANA — SHEET NUMBER 12



Land division corners are approximately positioned on this map

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

SHELBY COUNTY, INDIANA — SHEET NUMBER 13

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

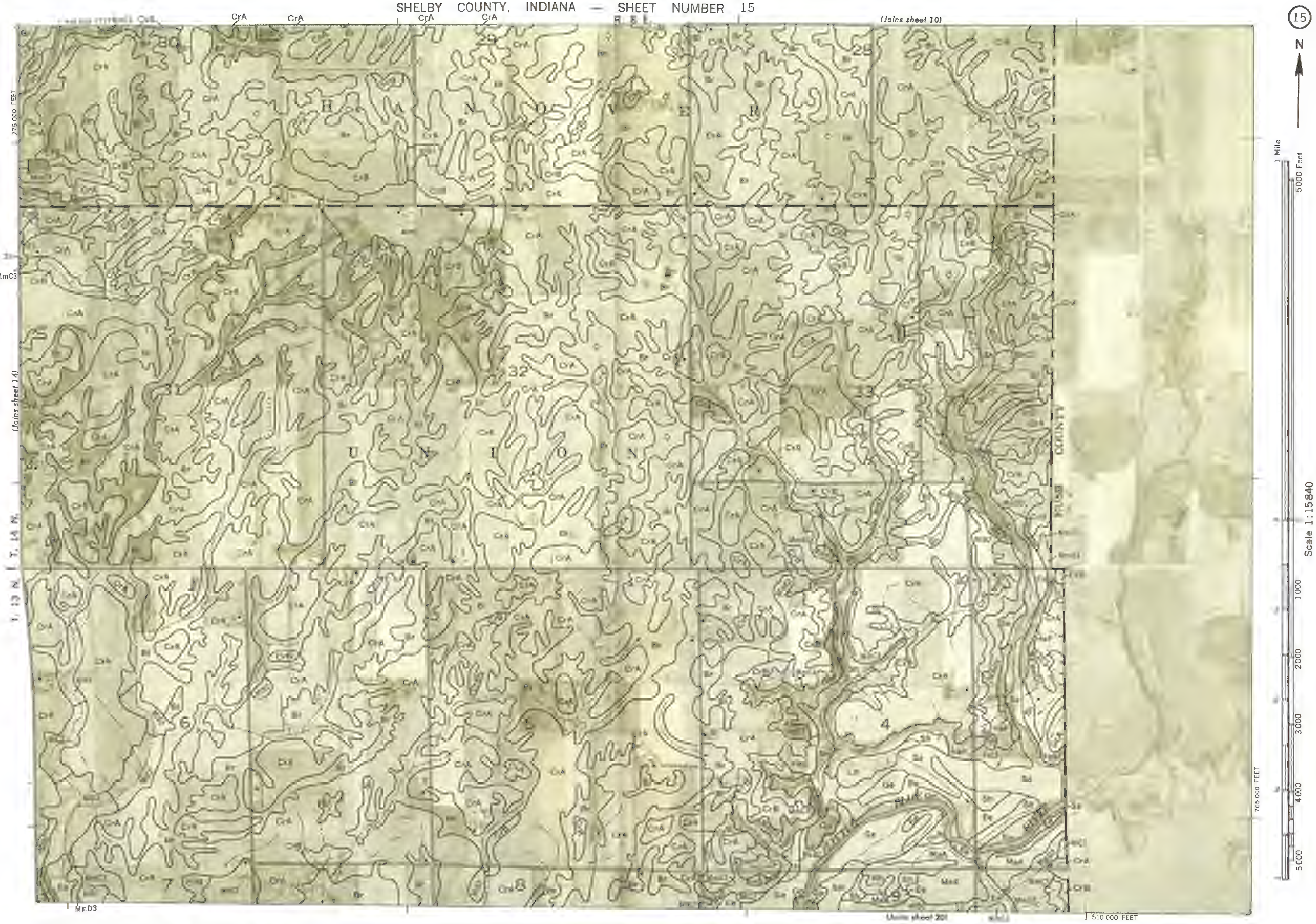
Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

SHELBY COUNTY, INDIANA — SHEET NUMBER 14

Photobase from 1970 aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land divisions on corners are approximately positioned on this map.



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

SHELBY COUNTY, INDIANA — SHEET NUMBER 17

17

N

Scale 1:15840

1 Mile

5000 Feet

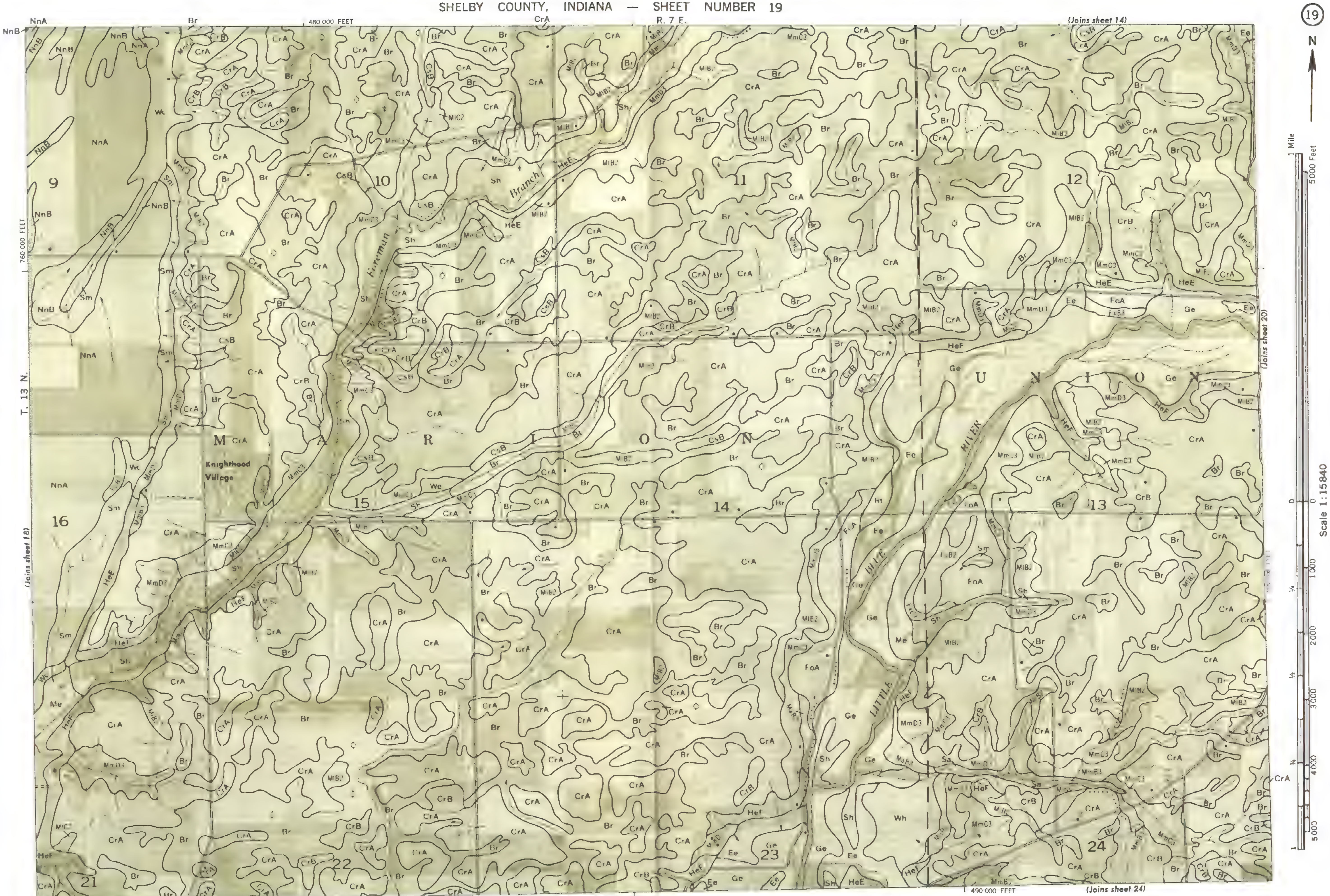
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station. Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land divisions corners are approximately positioned on this map

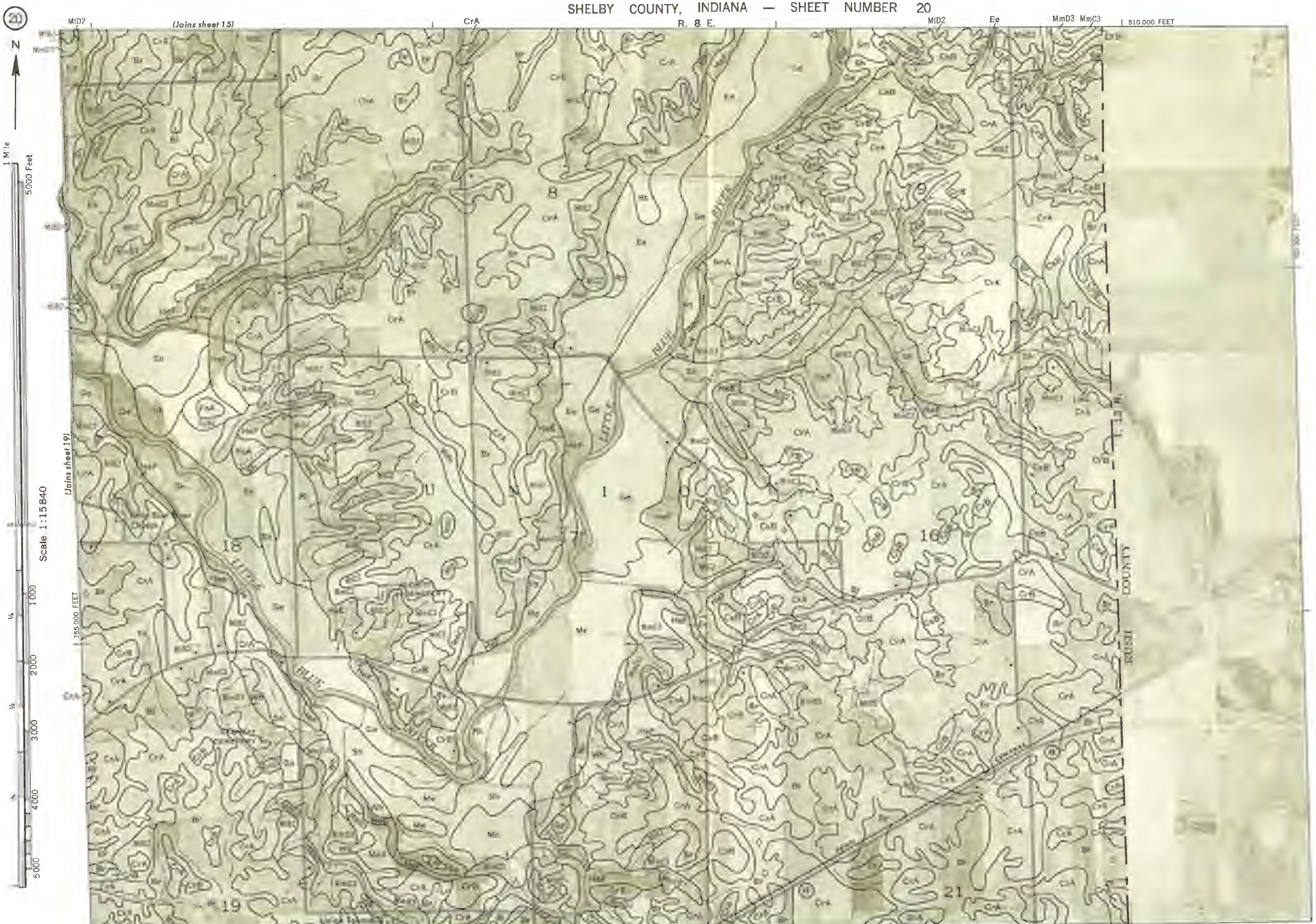
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

SHELBY COUNTY, INDIANA — SHEET NUMBER 20

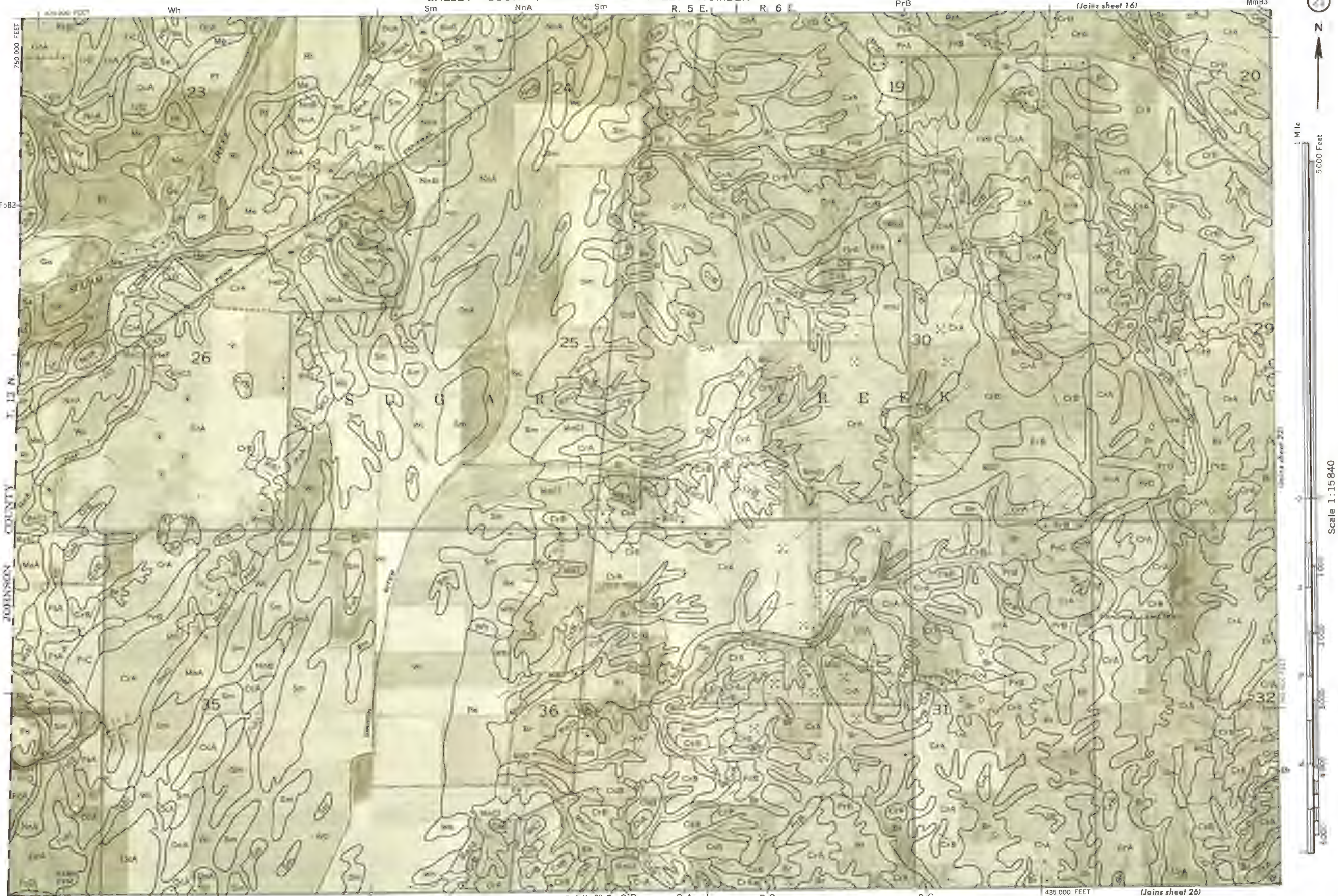


Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land divisions on corners are approximately positioned on this map

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

SHELBY COUNTY, INDIANA — SHEET NUMBER 21



This map is one of a set compiled in 1977 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

SHELBY COUNTY, INDIANA — SHEET NUMBER 22

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

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Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

24

SHELBY COUNTY, INDIANA — SHEET NUMBER 24

N

1 Mile

5000 Feet

Scale 1:15840

(Joins sheet 19)

(Joins sheet 23)

(Joins sheet 25)

(Joins sheet 29)

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone

Land divisions corners are approximately positioned on this map

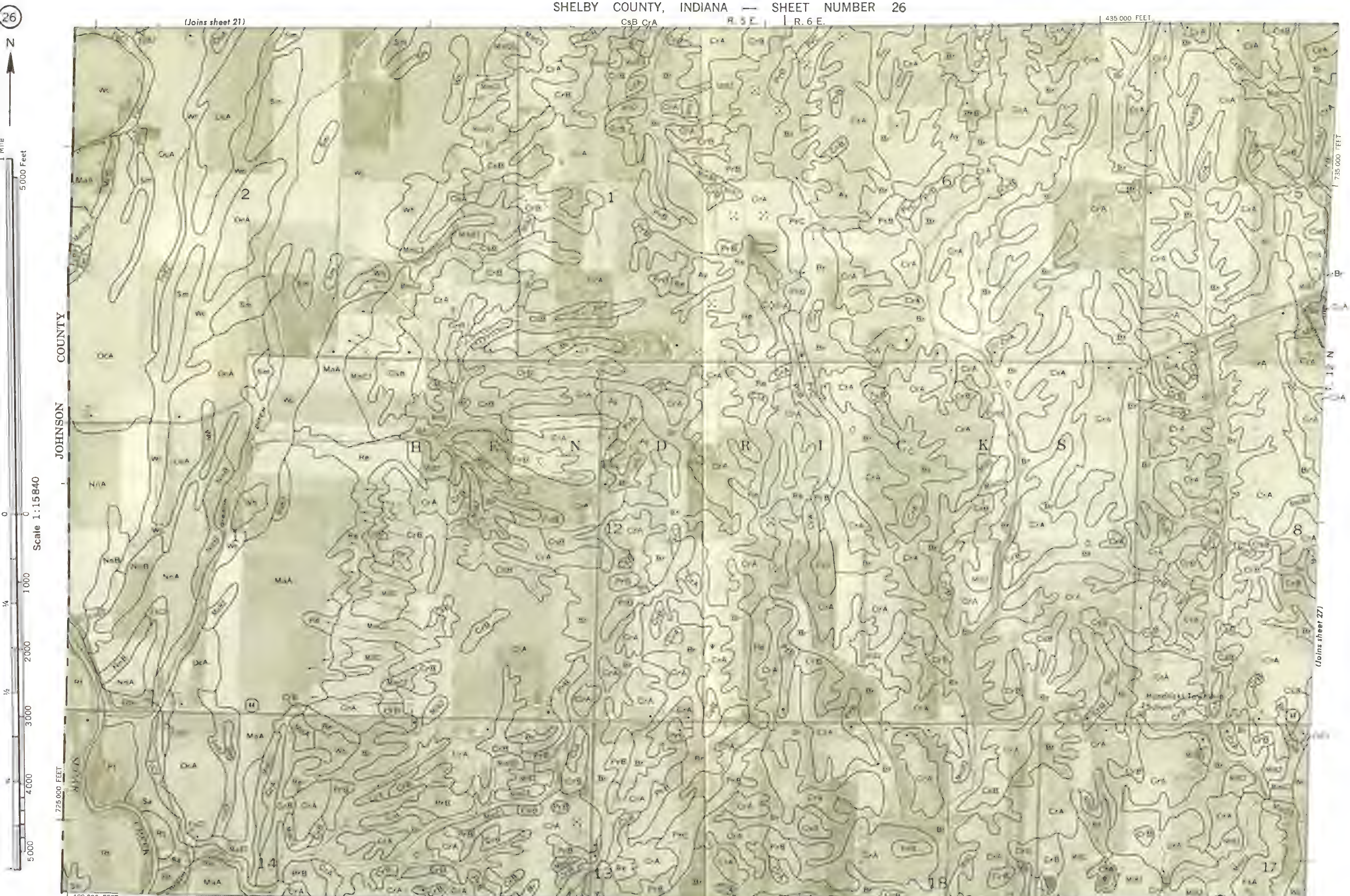
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

N

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

Land division corners are approximately positioned on this map

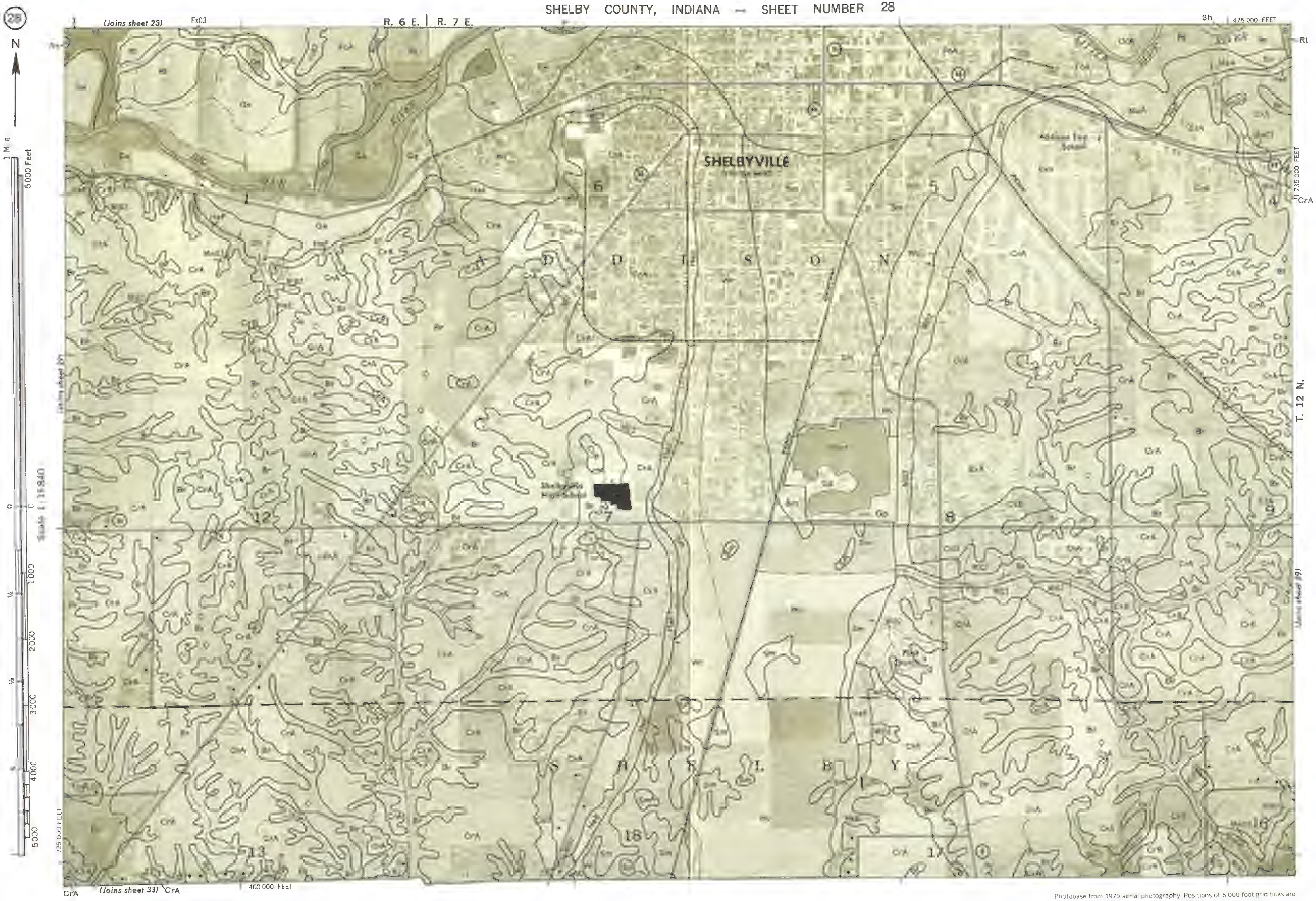
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment

SHELBY COUNTY, INDIANA — SHEET NUMBER 27

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

SHELBY COUNTY, INDIANA — SHEET NUMBER 28



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

SHELBY COUNTY, INDIANA — SHEET NUMBER 29

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

Land divisions corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

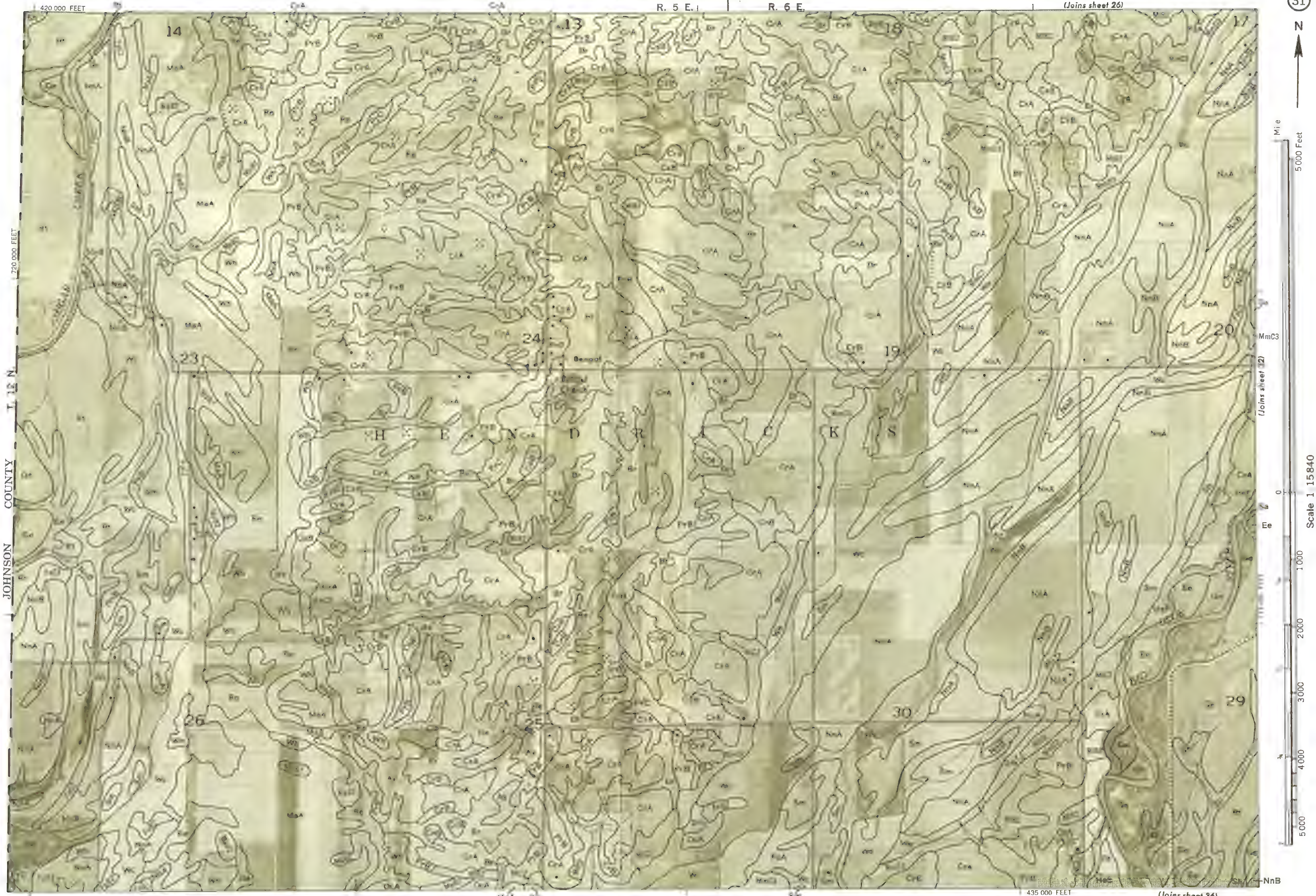
SHELBY COUNTY, INDIANA — SHEET NUMBER 30

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

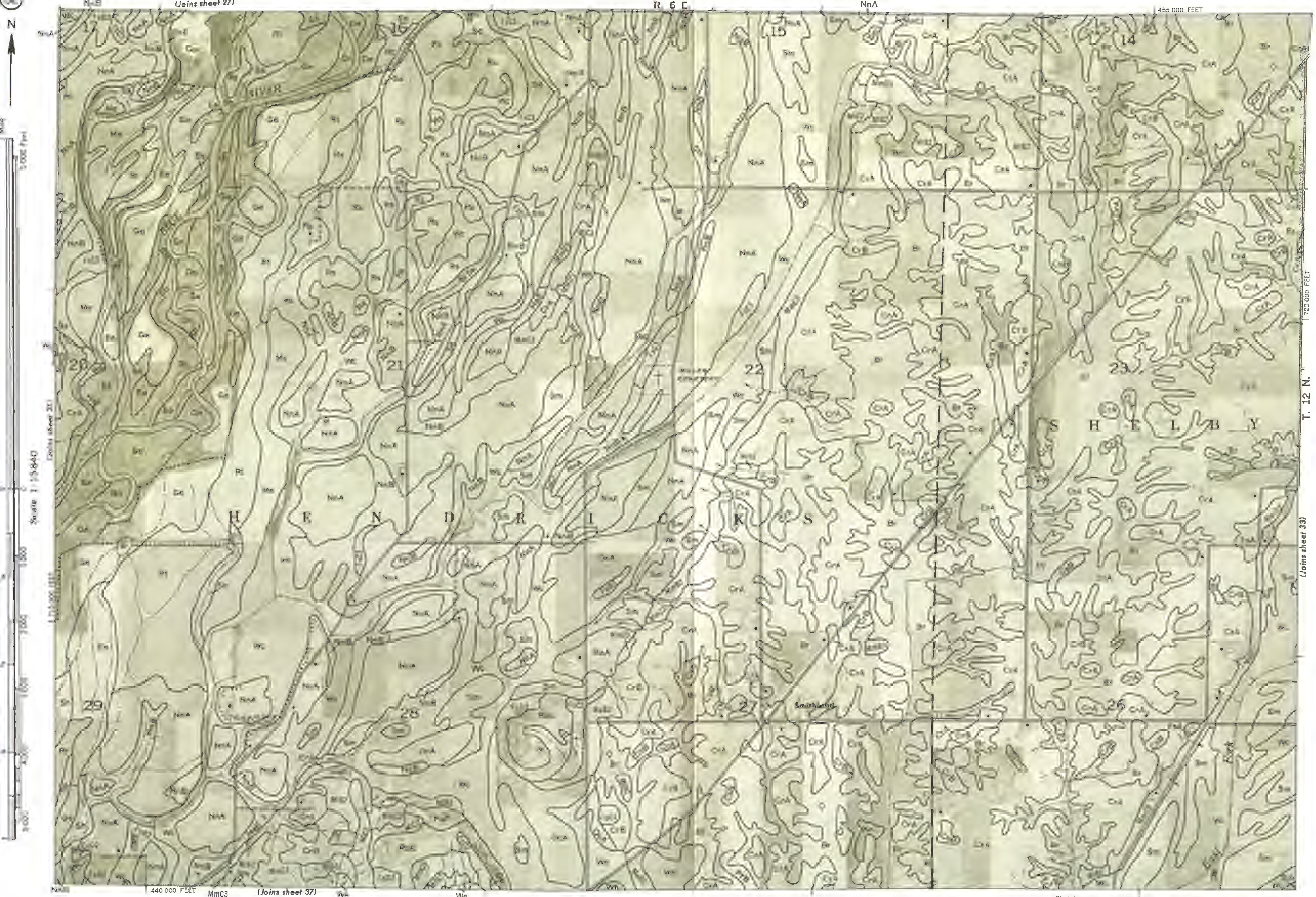
Land division corners are approximately positioned on this map

SHELBY COUNTY, INDIANA — SHEET NUMBER 31



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

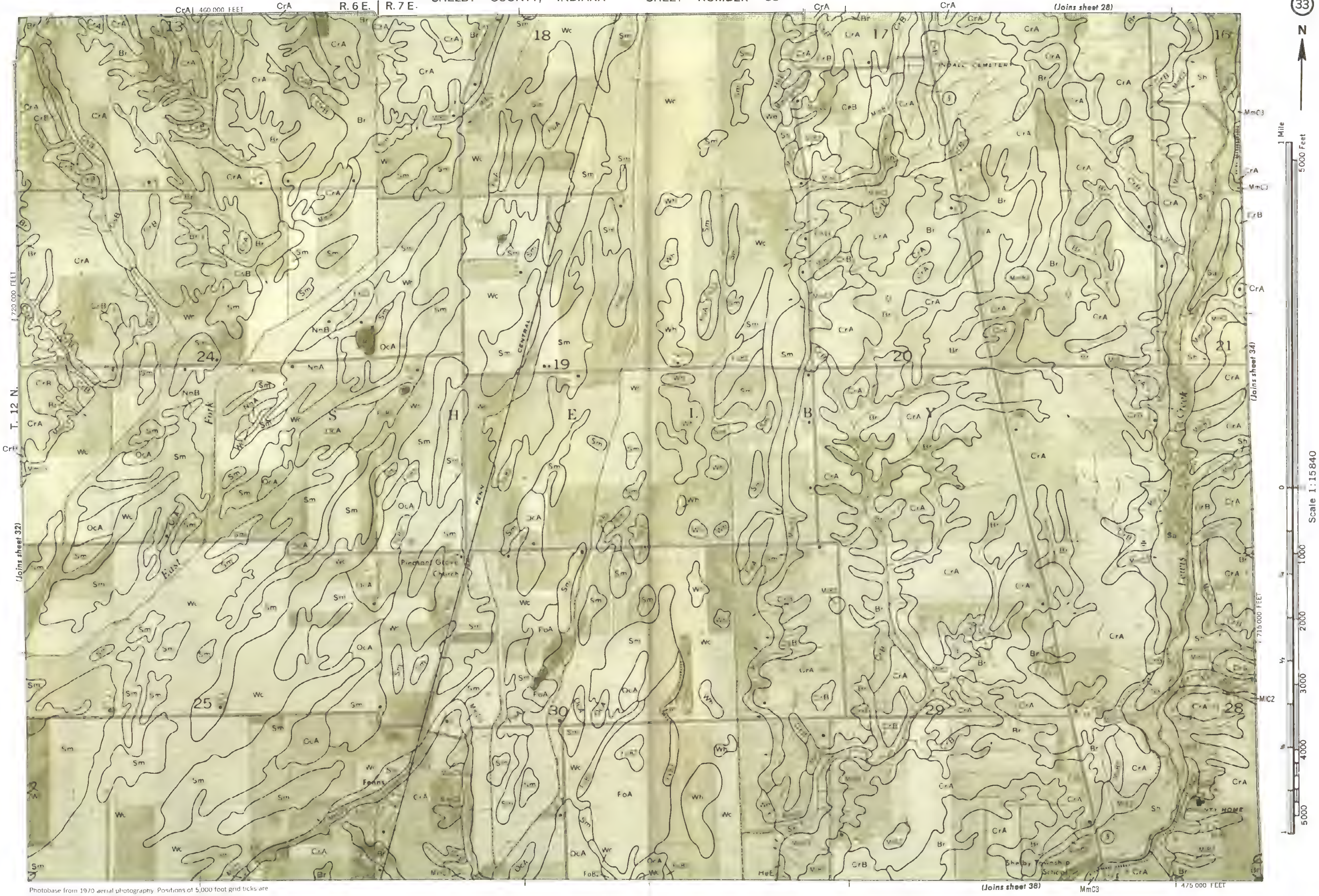


Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map

SHELBY COUNTY, INDIANA NO. 32

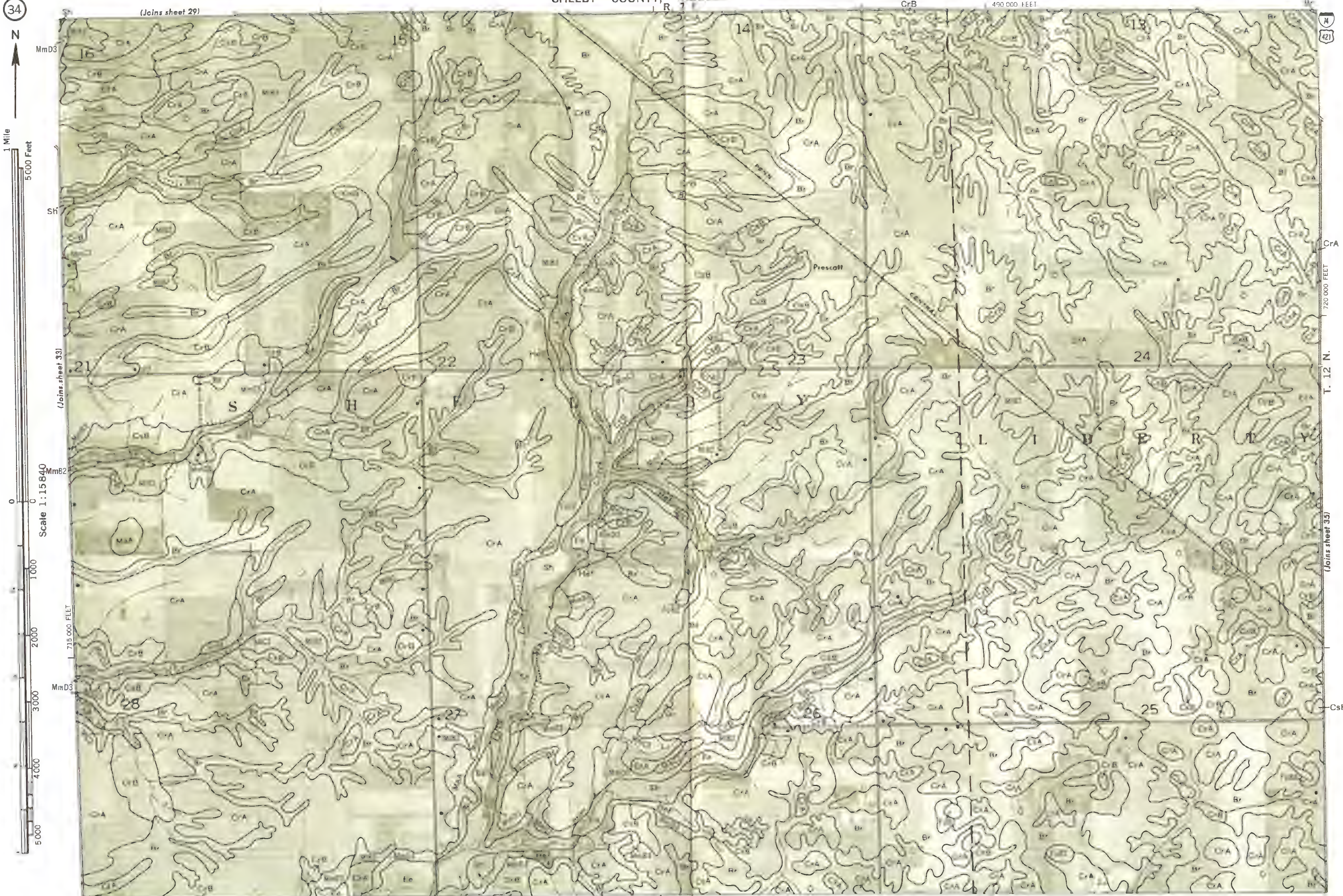
SHELBY COUNTY, INDIANA — SHEET NUMBER 33



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

SHELBY COUNTY, INDIANA — SHEET NUMBER 34

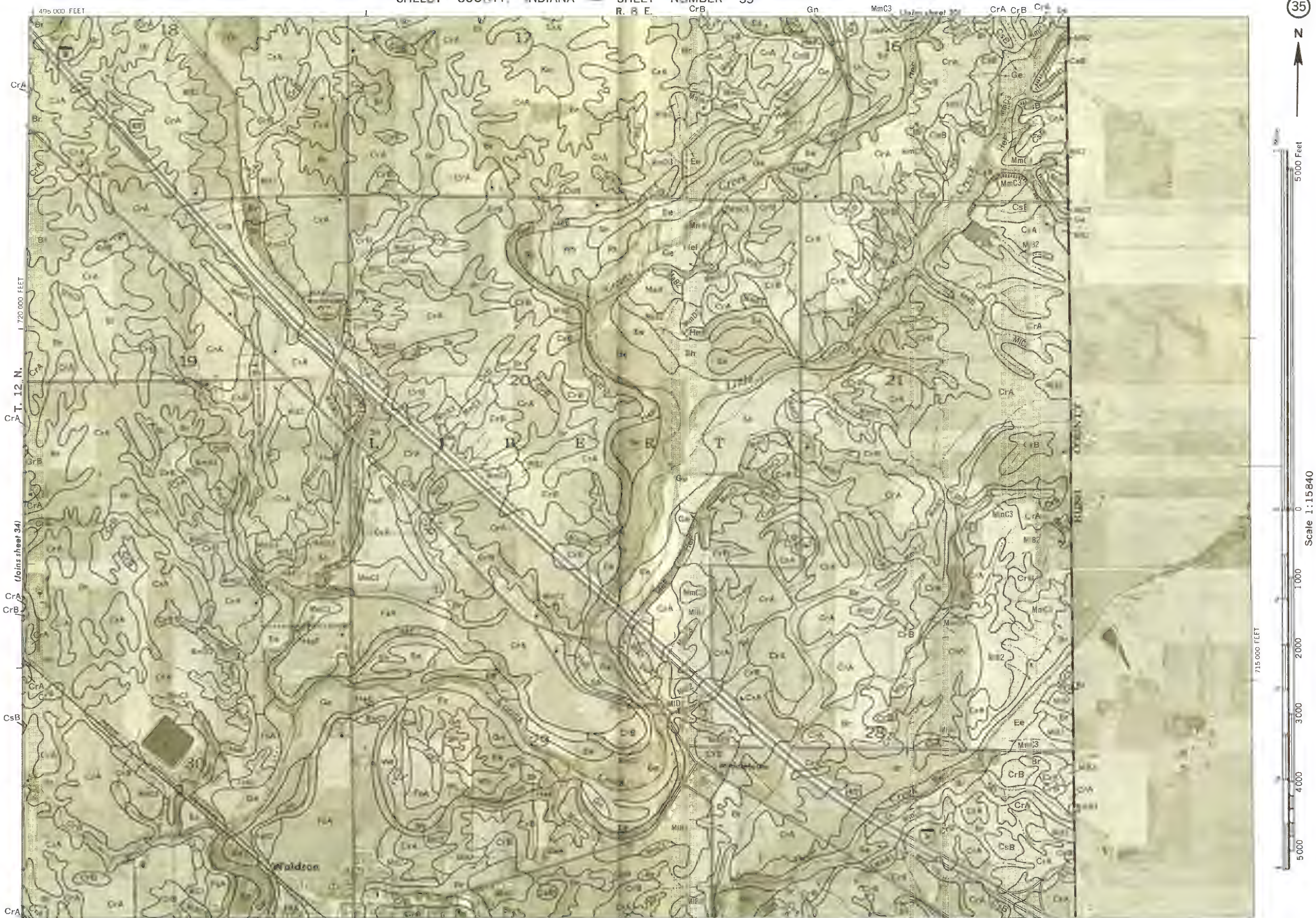


Land division corners are approximately positioned on this map

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

SHELBY COUNTY, INDIANA — SHEET NUMBER 35



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land divisions on corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

SHELBY COUNTY, INDIANA — SHEET NUMBER 36

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

SHELBY COUNTY, INDIANA — SHEET NUMBER 37

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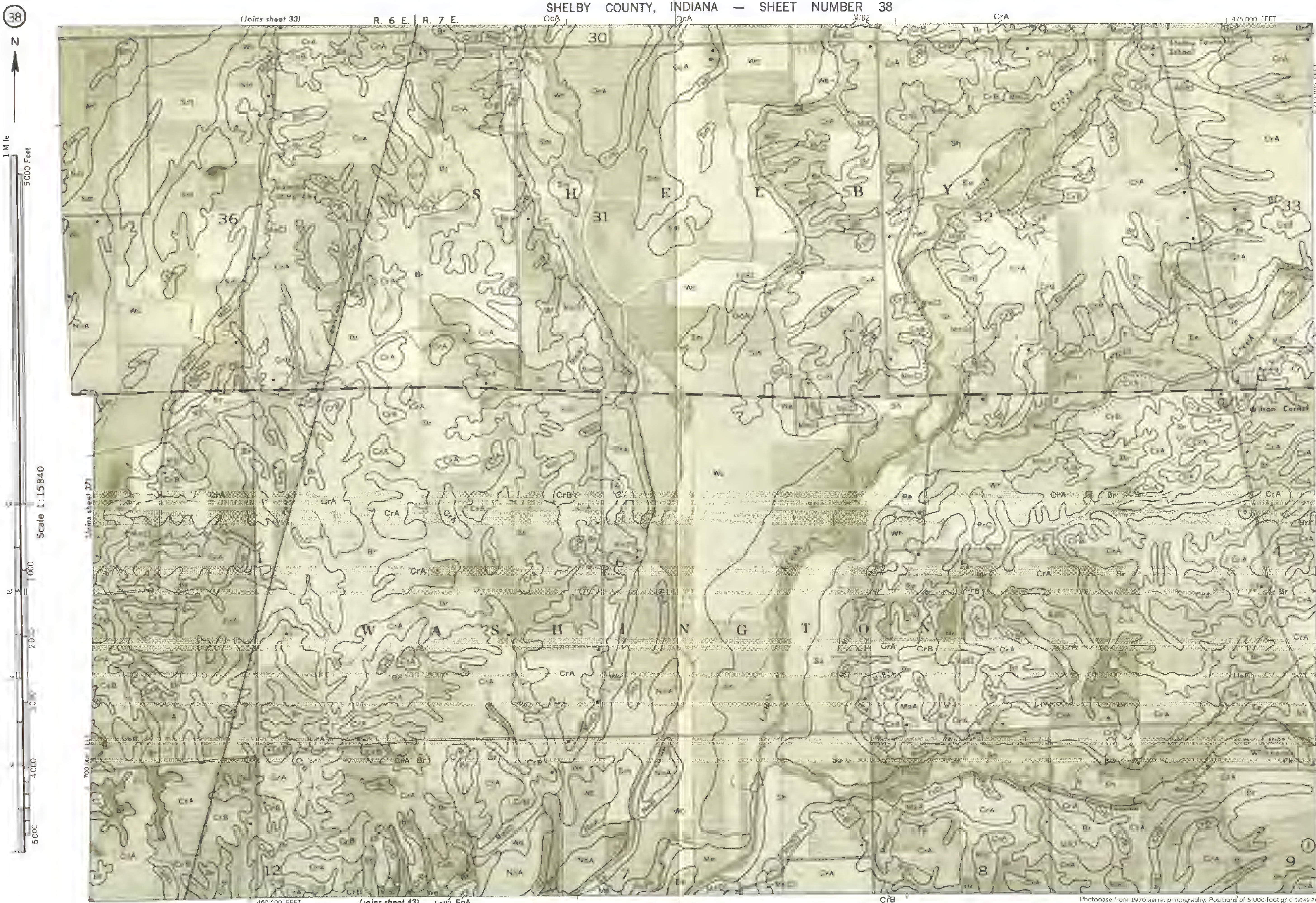
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

SHELBY COUNTY, INDIANA — SHEET NUMBER 38



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

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Land division corners are approximately positioned on this map.

approximate and based on the Indiana coordinate system, east zone

SHELBY COUNTY, INDIANA — SHEET NUMBER 40

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

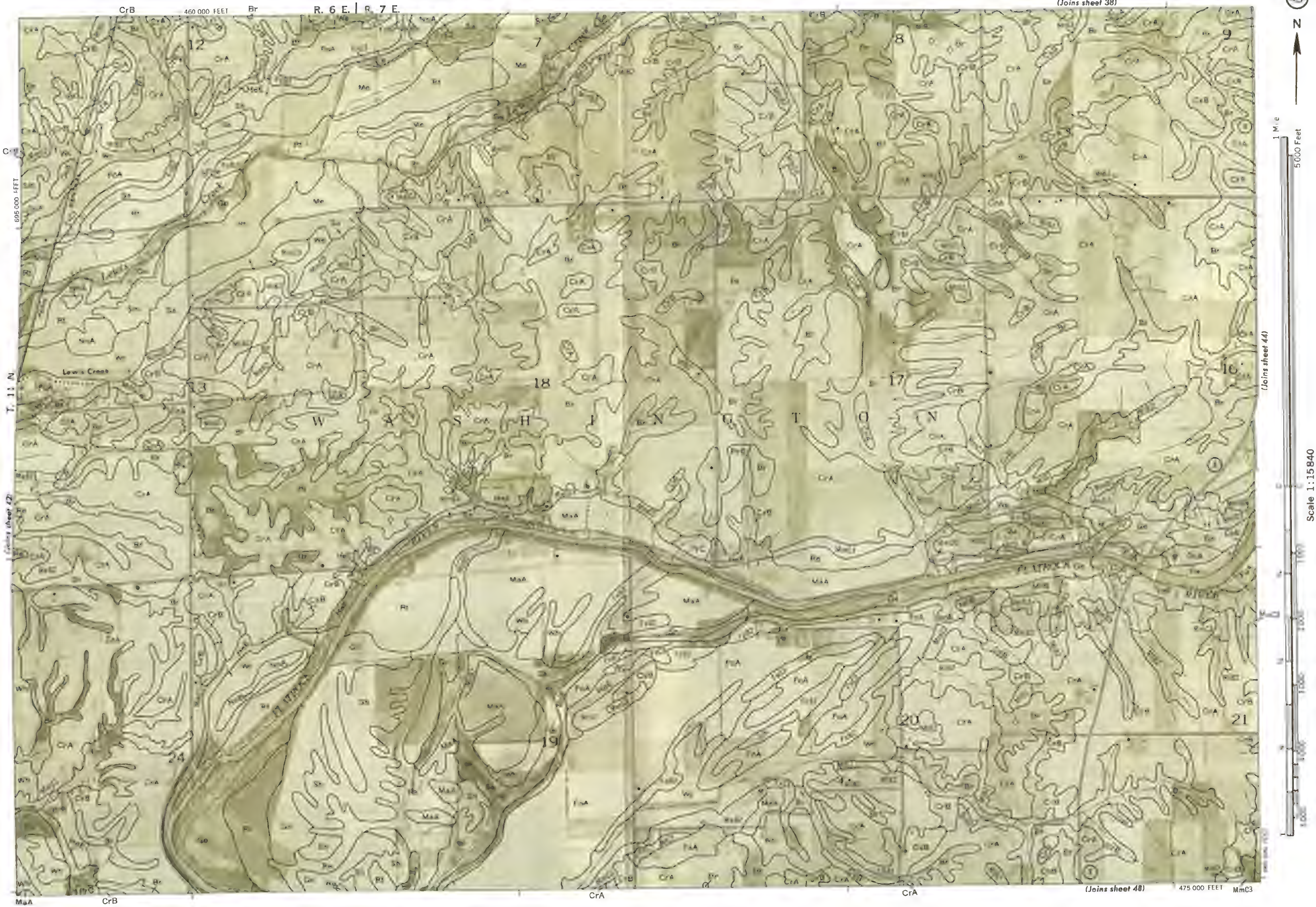
SHELBY COUNTY, INDIANA — SHEET NUMBER 42

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

SHELBY COUNTY, INDIANA — SHEET NUMBER 43



SHELBY COUNTY, INDIANA NO. 43

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

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Land division corners are approximately positioned on this map.

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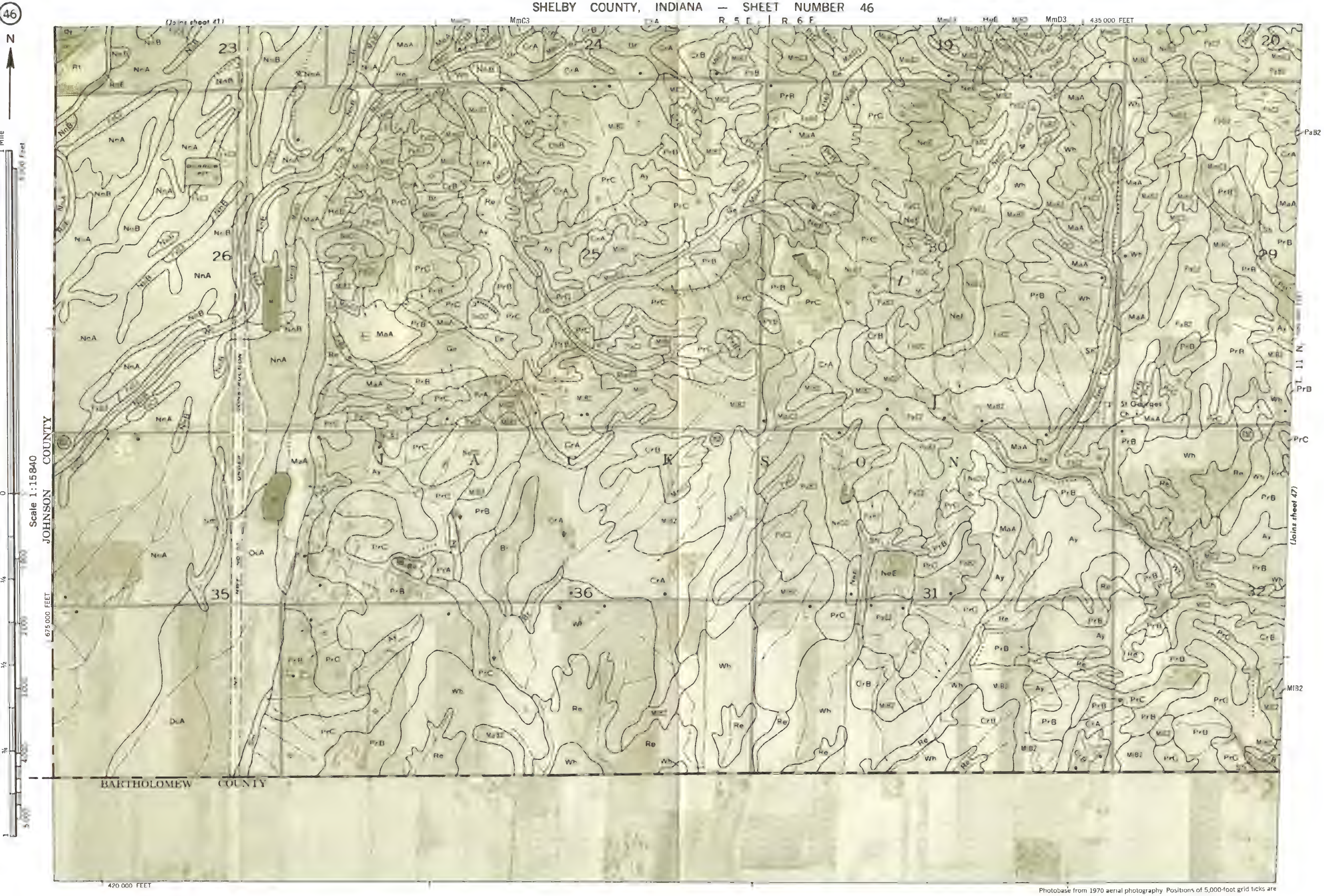
Photobase from 1970 aerial photography. 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone

SHELBY COUNTY, INDIANA NO. 45

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.
Land divisions on corners are approximately positioned on this map.

SHELBY COUNTY, INDIANA — SHEET NUMBER 46



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map

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SHELBY COUNTY, INDIANA NO. 46

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

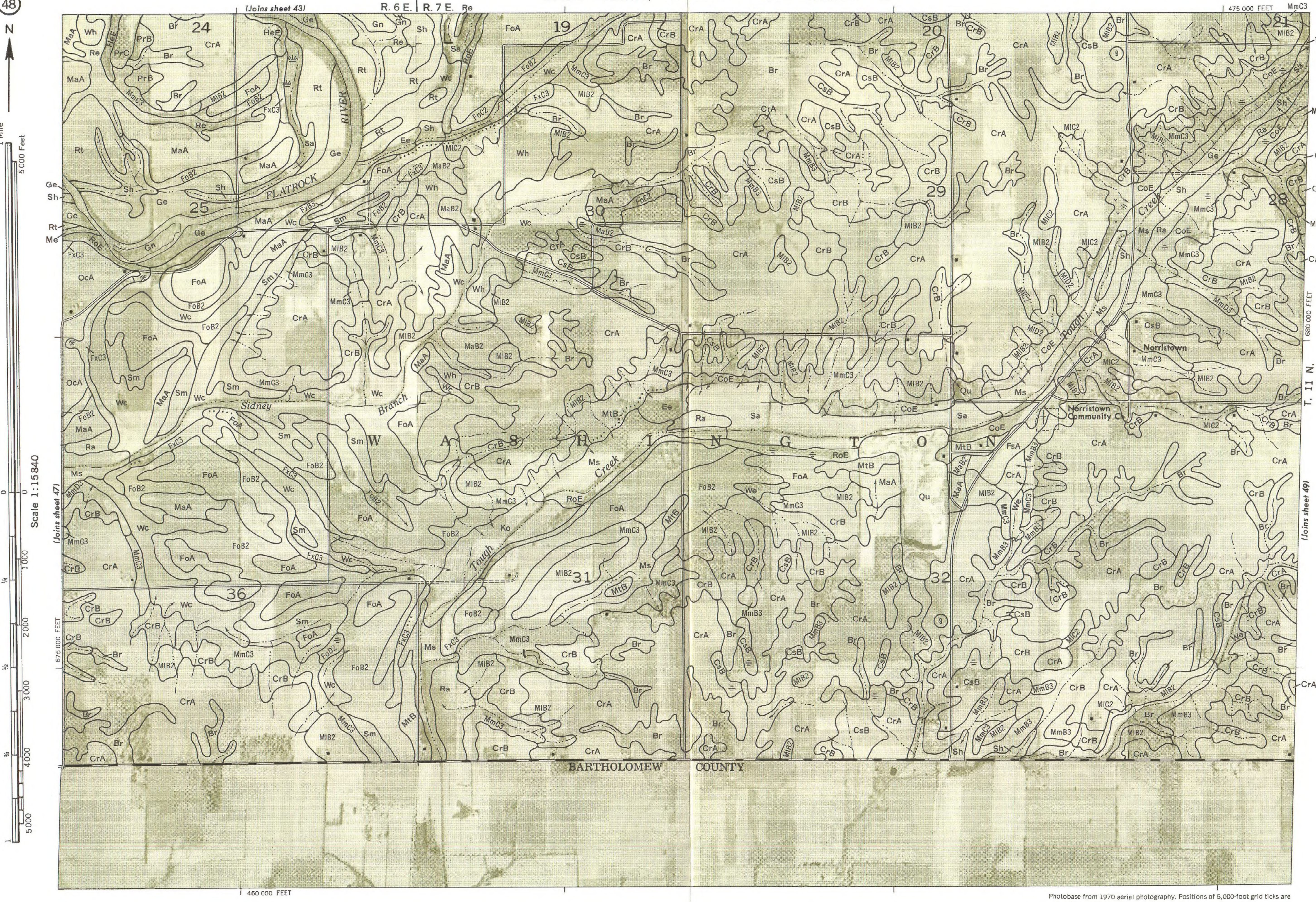
SHELBY COUNTY, INDIANA NO. 47

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

48

SHELBY COUNTY, INDIANA — SHEET NUMBER 48



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.

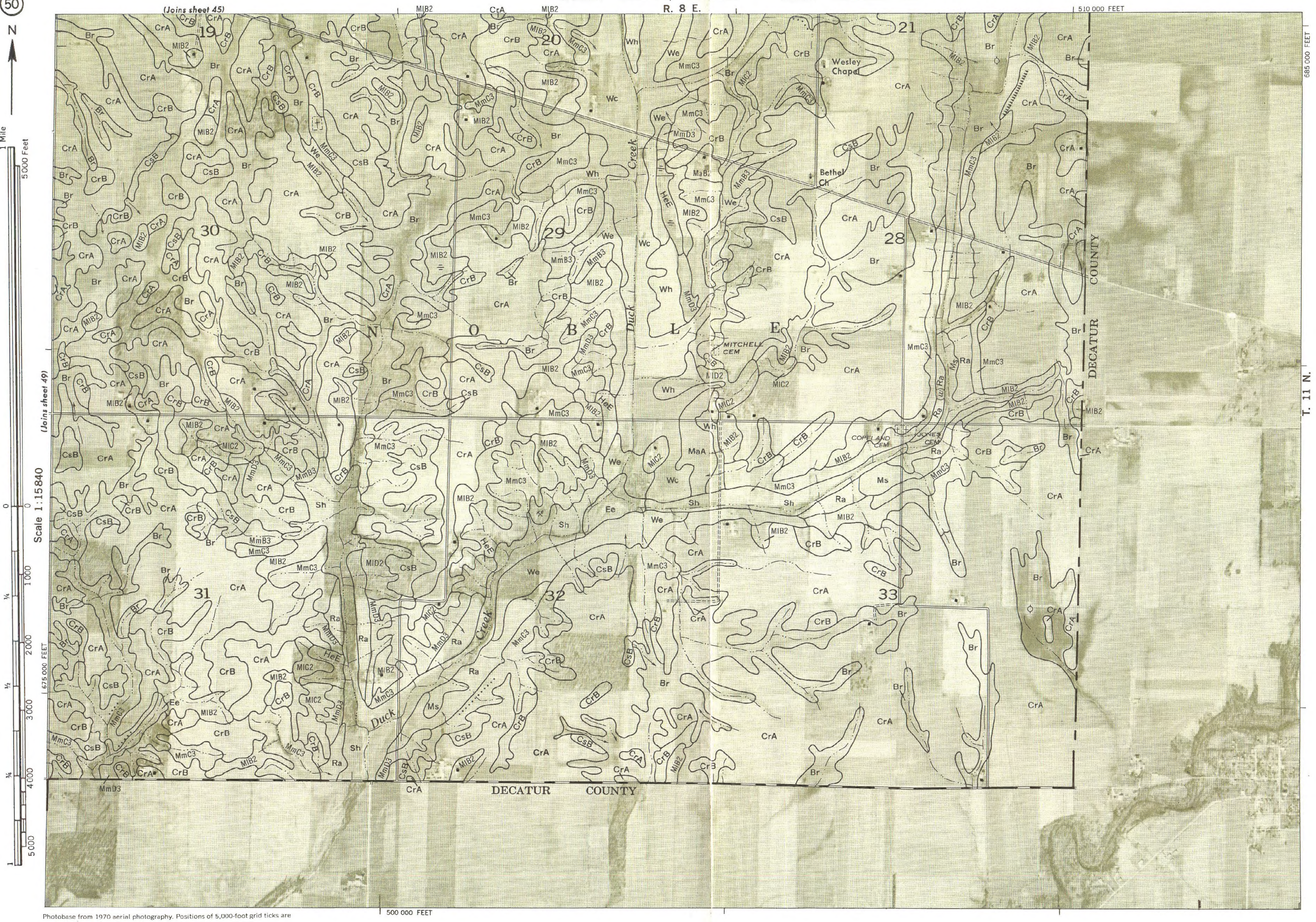
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

(49)

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

SHELBY COUNTY, INDIANA NO. 49

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.

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